# Application for Locally Adopted Energy Standards by the City of Santa Rosa In Accordance With Section 10-106 of the California Code of Regulations, Title 24, Part 1

November 30, 2010

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## 1.0 Executive Summary

The Santa Rosa City Council approved its revised Green Building Ordinance at a first hearing on October 19, 2010. This revised ordinance is scheduled to take effect on or shortly after January 1, 2010. Gabel Associates has researched and reviewed the feasibility and energy cost-effectiveness of permit applicants exceeding the state's 2008 Building Energy Efficiency Standards in order to meet the minimum energy efficiency requirements of the proposed ordinance.

*Overall Scope of the Ordinance*

| | |
|---|---|
| New ordinance or revision to previous ordinance? | Revised Ordinance |
| Projected Effective Date: | January 1, 2010 |
| Green building or stand-alone energy ordinance? | Green Building Ordinance |
| Do minimum energy requirements increase after initial effective date? | No |
| Occupancies covered? | All New Residential and Nonresidential Buildings |
| Energy requirements apply to new construction, additions, alterations? | New Construction Only |
| Special or unusual energy requirements? | No |
| Third party verification? | No |
| Implementation details in the ordinance or in a separate document? | None |

*Key Features of the Ordinance By Occupancy Type*

| Occupancy Type | General Requirements | Minimum Energy Requirement |
|---|---|---|
| New Low-rise Residential Buildings | 2010 CALGreen Tier 1 | 15% Better-than-Title 24 |
| New Nonresidential, High-rise Residential & Hotel/Motel Buildings | 2010 CALGreen Tier 1 | 15% Better-than-Title 24 |

## Text of the City of Santa Rosa Ordinance

**Approved by the Santa Rosa City Council on October 19, 2010.**

ORDINANCE NO. 3957

ORDINANCE OF THE CITY OF SANTA ROSA ADOPTING BY REFERENCE THE 2010 CALIFORNIA ADMINISTRATIVE CODE, 2010 CALIFORNIA BUILDING CODE, 2010 CALIFORNIA RESIDENTIAL CODE, 2010 CALIFORNIA GREEN BUILDING STANDARDS CODE, 2010 CALIFORNIA ELECTRICAL CODE, 2010 CALIFORNIA MECHANICAL CODE, 2010 CALIFORNIA PLUMBING CODE, 2010 CALIFORNIA HISTORICAL BUILDING CODE, 2010 CALIFORNIA EXISTING BUILDING CODE, 2010 CALIFORNIA ENERGY CODE, 2010 CALIFORNIA REFERENCED STANDARD CODE, 2009 INTERNATIONAL PROPERTY MAINTENANCE CODE

THE PEOPLE OF THE CITY OF SANTA ROSA DO ENACT AS FOLLOWS:

**Section 1.** The existing sections of Chapter 18-04, General Provisions, that are not repealed or amended by this ordinance are readopted and shall apply, as applicable, to the model codes herein adopted.

**Section 18-04.015, Subsection (A), of the Santa Rosa City Code is amended to read as follows:**

Section 18-04.015 "Adoption by Reference. (A) It is hereby adopted by reference by the City of Santa Rosa those certain model codes as adopted and amended by the State of California and defined in the Health and Safety Code and contained in Title 24 of the California Code of Regulations as applicable to various occupancies as depicted in the matrix adoption tables therein or the promulgating instruments thereof, which codes are known as: The CALIFORINIA ADMINISTRATIVE CODE, Part 1 of Title 24, 2010 Edition, published by the International Code Council and amended by the California Building Standards Commission; The CALIFORNIA BUILDING CODE, Part 2 of Title 24, 2010 Edition, published by the International Code Council and amended by the California Building Standards Commission, and Appendix C, Agricultural Buildings; Appendix H, Signs; Appendix I, Patio Covers; Appendix J, Grading; the CALIFORNIA RESIDENTIAL CODE, Part 2.5 of Title 24, 2010 Edition, published by the International Code Council and amended by the California Building Standards Commission, and Appendix H, Patio Covers; CALIFORNIA GREEN BUILDING STANDARDS CODE, Part 11 of Title 24, 2010 Edition, including Appendix Chapter A4, Residential Voluntary Measures at Tier I level, and Appendix A5, Nonresidential Voluntary Measures at Tier I level; CALIFORNIA REFERENCED STANDARDS CODE, Part 12 of Title 24, 2010 Edition, published by the International Code Council and the California Building Standards Commission.; The CALIFORNIA ELECTRICAL CODE, Part 3 of Title 24, 2010 Edition, published by the National Fire Protection Association and amended by the California Building Standards Commission, and Annex H, Administration; CALIFORNIA MECHANICAL CODE, Part 4 of Title 24, 2010 Edition, published by the International Association of Plumbing and Mechanical Officials and amended by the California Building Standards Commission, including tables and Appendix B, Uniform Mechanical Code Standards; The CALIFORNIA PLUMBING CODE, Part 5 of Title 24, 2010 Edition, published by the International Association of Plumbing and Mechanical

Officials and amended by the California Building Standards Commission, including IAPMO Installation Standards, including tables and Appendix A, Recommended Rules for Sizing the Water Piping System; Appendix B, Explanatory Notes on Combination Waste and Vent Systems; Appendix D, Sizing Storm Water Drainage Systems; Appendix I, Installation Standards; and Appendix L, Alternate Plumbing Systems; The CALIFORNIA HISTORICAL BUILDING CODE, Part 8 of Title 24, 2010 Edition, published by the International Code Council and adopted by the California Building Standards Commission; The CALIFORNIA EXISTING BUILDNG CODE, Part 10 of Title 24, 2010 Edition, published by the International Code Council and the California Building Standards Commission; The CALIFORNIA ENERGY CODE, Part 6 of Title 24, 2010 Edition, published by the International Code Council and the California Building Standards Commission; the INTERNATIONAL PROPERTY MAINTENANCE CODE, 2009 Edition, published by the International Code Council."

**Section 18-04.040 of the Santa Rosa City Code is amended to read as follows:**

"The Assistant Director of Community Development is appointed and designated as the Director of Building and Code Compliance, Chief Building Official, Building Official, Code Official or Administrative Authority, as such terms are used and such positions are established in the Santa Rosa City Code, California Administrative Code, California Building Code, California Residential Code, California Fire Code, California Electrical Code, California Mechanical Code, California Plumbing Code, California Energy Code, International Property Maintenance Code, California Green Building Standards Code, California Historical Building Code, and the California Existing Building Code. The Assistant Director of Community Development is charged with the enforcement of and given the authority to administer all provisions of such codes and City regulations and requirements adopted under the authority provided in Government Code Sections 38601(b) and 38660."

**Section 2.** The existing sections of Chapter 18-08, Permits and Fees, that are not repealed or amended by this ordinance are readopted and shall apply, as applicable, to the model codes herein adopted.

**Section 18-08.050 of the Santa Rosa City Code is amended to read as follows:**

"A building permit application and plan review shall expire if no permit is issued within one year of the date the application is filed. The construction plans and support documents submitted for review may thereafter be returned to the applicant or destroyed by the building official. The building official may extend the time for action by the applicant for a period of 180 days upon written request by the applicant showing that circumstances beyond the full control of the applicant have prevented any action from being taken. In the event that the applicant is diligently pursuing permit issuance and there have been no updates to the State of California adopted building codes or expiration of any other applicable City required permit since the time of initial submittal of the building permit application, the building official may extend the application an additional 180 days. Fees for extension of permit applications and issued permits shall be in the

amounts fixed by resolution of the City Council. In order to renew action on an application after expiration, the applicant shall reapply for the building permit, resubmit construction plans and support documents and pay a new plan review fee."

**Section 18-08.060 Permit Expiration and Extension, is added to the Santa Rosa City Code and shall read as follows:**

Section 18-08.060 Permit Expiration and Extension. "Every permit issued shall become invalid and shall be expired unless the work authorized by such permit is commenced within 180 days after its issuance, or if the work authorized by such permit is suspended or abandoned for a period of 180 days after the time the work is commenced. The building official may extend the time for action by the applicant for a period of 180 days upon a request by the applicant, in writing, showing that circumstances beyond the full control of the applicant have prevented any action from being taken. In the event that the applicant is diligently pursuing completion of work authorized by the permit the building official may extend the issued building permit an additional 180 days. Fees for extension of permit applications and issued permits shall be in the amounts fixed by resolution of the City Council. A request for permit extension may not be granted for an issued building permit if no work has begun or no inspections have been approved within three (3) years of the date the permit was issued. The construction plans and support documents submitted may thereafter be destroyed by the building official. In order to renew action on a permit after expiration, the applicant shall reapply for the building permit, resubmit construction plans and support documents and pay a new plan review fee."

**Section 18-08.150 of the Santa Rosa City Code is amended to read as follows:**

Section 18-08.150 "A reinspection fee as fixed by the fee schedule adopted by the City Council by resolution may be charged and collected for each extra inspection made necessary, as follows:

(A) Work not ready at time requested for inspection;
(B) Work required to be corrected on previous inspection not ready and/or correction not made at time requested for inspection

**Section 3.** The existing sections of Chapter 18-12, Improvement Requirements, that are not repealed or amended by this ordinance are readopted and shall apply, as applicable, to the model codes herein adopted.

**Section 18-12.015 of the Santa Rosa City Code is amended to read as follows:**

18-12.015 Exemptions. Notwithstanding the provisions of Section 18-12.010, improvements will not be required as follows:

(A) Single-family, duplexes, triplexes and four-plexes:
(1) Repairs and remodels as determined by the Director of Building and Code

Compliance would not trigger public improvements regardless of value,

(2) External additions, swimming pools, etc., less than $100,000.00 value will not trigger public improvement requirements;

(B) Shopping centers larger than 200,000 square feet:

(1) Internal or external remodels less than $200,000.00 value will not trigger public improvements,

(2) All external remodels exceeding a $200,000.00 value would trigger public improvements on the nearest public street frontage only except that the cost of any improvement directly impacted or necessitated by the business shall be borne by the applicant,

(3) All remodels and/or additions exceeding $500,000.00 value shall trigger all public improvement requirements regardless of frontage;

(C) Except as provided in subsections (A) and (B) of this section, all other properties including but not limited to multifamily residential, commercial and industrial properties shall be subject to public improvement requirements where the cost of any improvement to an existing building exceeds a value of $200,000.00."

**Section 4.** The existing sections of Chapter 18-16, California Building Code, that are not repealed or amended by this ordinance are readopted and shall apply, as applicable, to the model codes herein adopted.

**18-16.010 Citation of sections.**

"This chapter shall be known as the "California Building Code," and may be cited as such. For purposes of citation, the California Building Code, Part 2 of Title 24, 2010 Edition, published by the International Code Council and amended by the California Building Standards Commission, and only Appendix H, Signs; Appendix I, Patio Covers; and Appendix J, Grading and thereto adopted by reference and amended by the City, is renumbered by adding "18-16." before each section."

**Section 18-16.103.1 California Building Code, Section 103.1, Creation of enforcement agency, is amended to read as follows:**

Section 18-16.103.1 "The Division of Building and Code Compliance is hereby established and the official in charge thereof shall be known as the building official or chief building official."

**Section 18-16.105.2 California Building Code, Section 105.2, Work exempt from permit, Item #4 are amended to read as follows:**

Section 105.2 – Item #4. "Retaining walls that are not over 4 feet in height measured from the bottom of the footing to the top of the wall, unless supporting a surcharge or impounding Class I, II, or IIIA liquids, or retaining walls with a height from bottom of footing to the top of the retaining wall that does not exceed the distance from property line to the face of the retaining wall."

**Section 18-16.105.3.2 California Building Code, Section 105.3.2, Time limit of application, is amended to read as follows:**

Section 105.3.2 "Expiration of a permit application and plan review shall be determined as set forth in Section 18-08.050 of the Santa Rosa City Code."

**Section 18-16.105.5 California Building Code, Section 105.5, Expiration, is amended to read as follows:**

Section 105.5 "Expiration of an issued permit shall be determined as set forth in Section 18-08.060 of the Santa Rosa City Code."

**Section 18-16.108.8 Santa Rosa City Code section 18-16.108.8 is deleted.**

**Section 18-16.113.1 California Building Code, Section 113.1 – General - is amended to read as follows:**

Section 113.1 "The Board of Building Regulation Appeals, established in Section 18-04.050 of the Santa Rosa City Code, shall hear and determine any appeal arising from an action or determination made by the building official relative to the application and interpretation of this code. Section 18-04.060 of the City Code shall apply to the Board's determination. All appeals shall be filed in accordance with the requirements and within the time period set forth in Section 18-04.065 of the Santa Rosa City Code."

**18-16.501.2 California Building Code Section 501.2, Premise identification, is amended to read as follows:**

**Section 18-16.501.2. "Address Identification.** New and existing buildings shall be provided with approved illuminated address numbers or letters. They shall be installed on a contrasting background and be plainly visible from the street or road fronting the property. Address numbers shall be Arabic numerals or alphabetic letters. Where access is by means of a private road and the building cannot be viewed from the public way, a monument, pole, or other approved sign or means shall be used to identify the structure. Address identification shall comply with Fire Department Standards."

**18-16.501.2.1 California Building Code Section 501.2.1 is added to read as follows:**

**Section 18-16.501.2.1. One and two-family dwellings.** "Numbers for one and two family dwellings shall be a minimum of 4 inches in height with a minimum stroke width of 0.5 inches."

**18-16.501.2.2 California Building Code Section 501.2.2 is added to read as follows:**

**Section 18-16.501.2.2. Numbers for other than one and two-family dwellings.** "Numbers for other than one and two family dwellings shall be a minimum of 12 inches in height with a minimum stroke width of 2 inches. Suite and unit directional numbers shall be a minimum of 6 inches in height with a minimum stroke width of 0.75 inches. Individual unit numbers shall be a minimum of 4 inches in height with a minimum of strike with of 0.5 inches."

**18-16.501.2.3 California Building Code Section 501.2.3 is added to read as follows:**

**Section 18-16.501.2.3. "Complex Directory.** "Where two or more buildings are set back off the street in excess of 150 feet or when required by the Fire Code Official, an approved illuminated complex directory shall be provided at the main entrances to the property."

**18-16.501.2.4 California Building Code Section 501.2.4 is added to read as follows:**

**Section 18-16.501.2.4. "Roof Top Address.** Buildings four or more stories in height or greater than 15,000 square feet in area shall provide a reflective roof top address. Roof top address numbers shall be a minimum of 48 inches in height with a minimum stroke width of 8 inches and located in a central approved roof top area."

**Santa Rosa City Code Section 18-16.903.2.18 of the Santa Rosa City Code is deleted.**

**18-16.903.2 California Building Code Section 903.2 paragraph number one is amended to read as follows:**

**Section 18-16.903.2 "Where Required.** Approved automatic sprinkler systems in new buildings and structures shall be provided in locations described in sections 903.2.1 through section 903.2.19. The most restrictive requirement shall apply."

**18-16.903.2.18 California Building Code Section 903.2.18 Exception is amended to read as follows:**

**Section 18-16.903.2.18 "Exception -**
1. Carports of noncombustible construction with non-habitable spaces above.
2. Additions and or alterations not exceeding 50 percent of the existing square footage."

**Santa Rosa City Code Sections 18-16.903.18.1 through 18-16.903.18.4 of the Santa Rosa City Code are deleted.**

**18-16.903.2.19 California Building Code Section 903.2.19 is added to read as follows:**

**Section 18-16.903.2.19** "An approved automatic sprinkler system shall be installed and maintained in all newly constructed buildings.

**Exceptions:**

1. Agricultural buildings as approved by the Fire or Building Official.
2. Detached pool houses up to 1000 sq. ft. in floor area within 50 feet of the pool and limited to a single bathroom.
3. Detached non-combustible motor vehicle fuel dispensing canopies classified as Group M occupancy.
4. Detached Group U occupancies 1,000 square feet or less.
5. A room above a detached garage used for storage only that does not contain a bathroom, cooking or refrigeration facilities.
6. Carports of non-combustible construction with non-habitable spaces above.
7. B or M occupancies 500 sq. ft or less."

**18-16.903.2.19.1 California Building Code Section 903.2.19.1 is added to read as follows:**

**Section 18-16.903.2.19.1 "Additions.** Additions to existing buildings that increase square feet (based on the following percentages) calculated by the existing gross floor area shall meet the automatic fire sprinkler requirements for a newly constructed building:

| Square Feet | Increase |
|---|---|
| 0-1000 sq ft: | 200% or 2000 sq ft. maximum cumulative total |
| 1001-4000 sq ft: | 100% |
| > 4000 sq ft: | 50%" |

**18-16.903.2.19.2 California Building Code Section 903.2.19.2 is added to read as follows:**

**Section 18-16.903.2.19.2 "Remodels, Alterations, or Repairs.** For alterations or repairs to existing building(s) involving demolition, removal, or repair of more than 50% of the structure, the building shall meet the automatic fire sprinkler requirements for a newly constructed building.

Exception: Alterations or additions made solely for the purpose of complying with the American's with Disabilities Act."

**18-16.903.2.19.3 California Building Code Section 903.2.19.3 is added to read as follows:**

**Section 18-16.903.2.19.3 "Changes of Occupancy**. When any change of occupancy occurs where the proposed new occupancy classification is more hazardous, or as determined by the Fire Code Official including the conversion of residential buildings to condominiums, the building shall meet the fire sprinkler requirements for a newly constructed building.

**Santa Rosa City Code Sections 18-16.903.4 and 18-16.903.4.1 are deleted.**

**18-16.903.4.2 California Building Code Section 903.4.2 is amended to read as follows:**

**Section 18-16.903.4.2 "Alarms.** One exterior approved audible and visible device shall be connected to every automatic fire sprinkler system in an approved location. Such sprinkler waterflow alarm devices shall be activated by waterflow equivalent to the flow of a single sprinkler of the smallest orifice size installed in the system. Where a building fire alarm system is installed, actuation of the automatic fire sprinkler system shall actuate the building fire alarm system.

Every new commercial fire alarm system installed as a sprinkler system monitoring alarm shall also function for the purpose of evacuation, including those systems activated solely by fire sprinkler systems, so that occupants of the building shall be notified audibly and visually within each suite or building division. A minimum of one device shall be located in each suite or building division in an occupied location."

**18-16.905.3.1 California Building Code Section 905.3.1 Exception 2 is amended to read as follows:**

**Section 18-16.905.3.1 "Exception 2.** Buildings that are three or more stories in height."

**18-16.905.9 California Building Code Section 905.9 Exception 2 is deleted.**

**Santa Rosa City Code Section 18-16.907.2.8.1 is deleted.**

**18-16.907.8.1 California Building Code Section 907.8.1 is added to read as follows:**

**Section 18-16.907.8.1 "False Fire Alarms.** Owners of properties with a fire alarm system shall maintain the system in accordance with section 907.9 of the California Fire Code. When more than one false fire alarm activates within a Calendar year, a fee shall be assessed per the current adopted fee schedule."

**Santa Rosa City Code Section 18-16.907.29 is deleted.**

**18-16.910.1 California Building Code Section 910.1 Exception 2 is deleted.**

**18-16.910.3.2.1 California Building Code Section 910.3.2.1 is deleted.**

**18-16.1512 California Building Code Section 1512 is added to read as follows:**

**Section 18-16.1512 "Solar photovoltaic panels/modules.** Roof Mounted photovoltaic panels/modules shall comply with the requirements of the California Electrical Code and the California Fire Code as amended."

**Section 18-16.1803.3 Santa Rosa City Code section 18-16.1803.3 is deleted.**

**Section 18-16.1804.3 California Building Code, Section 1804.3, Site grading, is amended to include Exception #2 and shall read as follows:**

**1804.3 Exception #1:** "Where climatic or soil conditions warrant, the slope of the ground away from the building foundation shall be permitted to be reduced to not less than one unit vertical in 48 units horizontal (2-percent slope)
**1804.3 Exception #2:** "A drainage system designed by a registered design professional based on recommendations provided by a soils/geotechnical engineer may be approved by the building official as meeting the intent of this section."

**Sections 18-16.A103.1 through 18-16.A112 of the Santa Rosa City Code are deleted.**

**Section 18-16.H101.2 California Building Code, Appendix H, Signs, Section H101.2, Signs exempt from permits, is amended to delete Item #1 and Item #4.**

**Section 18-16.J103.2 California Building Code, Appendix J, Grading, Section J103.2, Exemptions, is amended to read as follows:**

Section J103.2 – "Exemptions: A grading permit shall not be required for the following:

1. Grading of less than 50 cubic yards in an isolated, self-contained area, provided there is no danger to the public, and that such grading will not adversely affect adjoining properties.
2. Excavation for construction of a structure permitted under this code.
3. Cemetery graves.
4. Refuse disposal sites controlled by other regulations.
5. Excavations for wells, or trenches for utilities.
6. Exploratory excavations less than 50 cubic yards performed under the direction of a registered design professional.
7. An excavation of less than 50 cubic yards that (1) is less than 2 feet in depth or (2) does not create a cut slope greater than 5 feet in height and steeper than 1 unit vertical in 1 ½ units horizontal (66.7% slope.)
8. A fill less than 1 foot in depth and placed on natural terrain with a slope flatter than 1 unit vertical in 5 units horizontal (20% slope), or less than 3 feet in depth, not intended to support structures, that does not exceed 50 cubic yards on any one lot and does not obstruct a drainage course.
9. Excavations and fills for a soil, water, wildlife, or other resource conservation, restoration, or enhancement project, where a public agency assumes full responsibility for the work.

Exemptions from the permit requirements of this appendix shall not be deemed to grant authorization for any work to be done in any manner in violation of the provisions of this code or any other laws or ordinances of this jurisdiction."

**18-16.J104.5 California Building Code, Appendix J, is amended by adding section J104.5 to read as follows:**

J104.5 "Grading designation. Grading in excess of 5,000 cubic yards shall be performed in accordance with the approved grading plan prepared by a civil engineer, and shall be designated as "engineered grading". Grading involving less than 5,000 cubic yards shall be designated as "regular grading" unless the permittee chooses to have the grading performed as engineered grading, or the building official determines that special conditions or unusual hazards exist, in which case, grading shall conform to the requirements for engineered grading."

**18-16.J104.6 California Building Code, Appendix J, is amended by adding section J104.6 to read as follows:**

J104.6 "Engineered grading requirements. Applications for a grading permit shall be accompanied by plans and specifications, and supporting data consisting of a soils engineering report and engineering geology report. The plans and specifications shall be prepared and signed by an individual licensed by the state to prepare such plans or specifications when required by the building official.

Specifications shall contain information covering construction and material requirements.

Plans shall be drawn to scale and shall be of sufficient clarity to indicate the nature and extent of the work proposed and show in detail that they will conform to the provisions of this code and all relevant laws, ordinances, rules and regulations. The first sheet of each set of plans shall give location of the work, the name and address of the owner, and the person by whom they were prepared.

The plans shall include the following information:

1. General vicinity of the proposed site.
2. Property limits and accurate contours of existing ground and details of terrain and area drainage.
3. Limiting dimensions, elevations of finish contours to be achieved by the grading, and proposed drainage channels and related construction.
4. Detailed plans of all surface and subsurface drainage devices, walls, cribbing, dams and other protective devices to be constructed with, or as a part of, the proposed work, together with a map showing the drainage area and the estimated runoff of the area served by an drains.
5. Location of any buildings or structures on the property where the work is to be performed and the location of any buildings or structures on land of adjacent owners that are within 15 feet of the property or that may be affected by the proposed grading operations.
6. Recommendations included in the soils engineering reports and the engineering geology report shall be incorporated in the grading plans or specifications. When approved by the building official, specific recommendations contained in the soils

engineering report and the engineering geology report, that are applicable to grading, may be included by reference.

7. The dates of the soils engineering and engineering geology reports, together with the names, addresses and phone numbers of the firms or individuals who prepared the reports."

**18-16.J104.7 Santa Rosa City Code Section 18-16.J104.7, Regular grading requirements is deleted.**

**18-16.J105.1 California Building Code, Appendix J, Section J105.1, General, is amended to read as follows:**

J105.1 "General. Grading operations for which a permit is required shall be subject to inspections by the building official. Professional inspection of grading operations shall be provided by the civil engineer, soils engineer and the engineering geologist retained to provide such services in accordance with Section 1704.7 for engineered grading and as required by the building official for regular grading."

**18-16.J105.2 California Building Code, Appendix J, Section J105.2, Special inspections, is amended to read as follows:**

J105A.2 "Civil Engineer. The civil engineer shall provide special inspection within such engineer's area of technical specialty, which shall consist of observation and review as to the establishment of line, grade and surface drainage of the development area. If revised plans are required during the course of the work they shall be prepared by the civil engineer."

**18-16.J105.3 California Building Code, Appendix J, is amended by adding section J105.3 to read as follows:**

J105.3 "Soils Engineer. The soils engineer shall provide professional inspection with such engineer's area of technical specialty, which shall include observation during grading and the testing for required compaction. The soils engineer shall provide sufficient observation during the preparation of the natural ground and compaction of the fill to verify that such work is being performed in accordance with the conditions of the approved plan and the appropriate requirements of this chapter. Revised recommendations relating to conditions differing from the approved soils engineering and engineering geology reports shall be submitted to the permittee, the building official and the civil engineer."

**18-16.J105.4 California Building Code, Appendix J, is amended by adding section J105.4 to read as follows:**

J105.4 "Engineering Geologist. The engineering geologist shall provide professional inspection within such engineer's area of technical specialty, which shall include professional inspection of the bedrock excavation to determine if conditions encountered

are in conformance with the approved report. Revised recommendations relating to conditions differing from the approved engineering geology report shall be submitted to the soils engineer."

**18-16.J105.5 California Building Code, Appendix J, is amended by adding section J105.5 to read as follows:**

J105.5 "Permittee. The permittee shall be responsible for the work to be performed in accordance with the approved plans and specifications and in conformance with the provisions of this code, and the permittee shall engage consultants, if required, to provide professional inspections on a timely basis. The permittee shall act as a coordinator between the consultants, the contractors and the building official. In the event of changed conditions, the permittee shall be responsible for informing the building official of such changes and shall provide revised plans for approval."

**18-16.J105.6 California Building Code, Appendix J, is amended by adding section J105.6 to read as follows:**

J105.6 "Building Official. The building official shall inspect the project at the various stages of work requiring approval to determine that adequate control is being exercised by the professional consultants."

**18-16.J105.7 California Building Code, Appendix J, is amended by adding section J105.7 to read as follows:**

J105.7 "Notification of Noncompliance. If, in the course of fulfilling their respective duties under this chapter, the civil engineer, the soils engineer, or the engineering geologist find that the work is not being done in conformance with this chapter or the approved grading plans, the discrepancies shall be reported immediately in writing to the permittee and to the building official."

**18-16.J105.8 California Building Code, Appendix J, is amended by adding section J105.8 to read as follows:**

J105.8 "Transfer of Responsibility. If the civil engineer, the soils engineer, or the engineering geologist of record is changed during grading, the work shall be stopped until the replacement has agreed in writing to accept the responsibility within the area of technical competence for approval upon completion of the work. It shall be the duty of the permittee to notify the building official in writing of such change prior to the recommencement of such grading."

**18-16.J105.9 California Building Code, Appendix J, is amended by adding section J105.9 to read as follows:**

J105.9 "Final Reports. Upon completion of the rough grading work and at the final completion of the work, the following reports, drawings and supplements are required for

engineered grading or when professional inspection is performed for regular grading, as applicable:

1. An as-built grading plan prepared by the civil engineer retained to provide such services in accordance with section 1704.7 showing original ground surface elevations, as-graded ground surface elevations, lot drainage patterns, and the locations and elevations of surface drainage facilities and of the outlets of subsurface drains. As-constructed locations, elevations and details of subsurface drains shall be shown as reported by the soils engineer.
   Civil engineers shall state that to the best of their knowledge the work within their area of responsibility was done in accordance with the final approved grading plans.
2. A report prepared by the soils engineer retained to provide such services in accordance with Section 1704.7, including locations and elevations of field density tests, summaries of field and laboratory tests, other substantiating data, and comments on any changes made during the grading and their effect on the recommendations made in the approved soils engineering investigation report. Soils engineers shall submit a statement that, to the best of their knowledge, the work within their area of responsibilities is in accordance with the approved soils engineering report and applicable provisions of this chapter.
3. A report prepared by the engineering geologist retained to provide such services in accordance with Section 1704.7, including a final description of the geology of the site and any new information disclosed during the grading and the effect of same on recommendations incorporated in the approved grading plans. Engineering geologists shall submit a statement that, to the best of their knowledge, the work within their area of responsibility is in accordance with the approved engineering geologist report and applicable provisions of this chapter.
4. The grading contractor shall submit in a form prescribed by the building official a statement of conformance to approved as-built plan and the specifications."

**18-16.J105.10 California Building Code, Appendix J, is amended by adding section J105.10 to read as follows:**

J105.10 "Notification of Completion. The permittee shall notify the building official when the grading operation is ready for final inspection. Final approval shall not be given until all work, including installation of all drainage facilities and their protective devices, and all erosion-control measures have been completed in accordance with the final approved grading plan, and the required reports have been submitted."

**Section 5.** The existing sections of chapter 18-20, Property Maintenance Code, that are not repealed or amended by this ordinance are readopted and shall apply, as applicable, to the model codes herein adopted.

**18-20.010 Citation of sections.**
This chapter shall be known as the "Property Maintenance Code," and may be cited as such. For purposes of citation, the International Property Maintenance Code, 2009 Edition, published by

the International Code Council; adopted by reference and amended by the City, is renumbered by adding "18-20." before each section.

**18-20.102.3 International Property Maintenance Code Section 102.3 is amended to read as follows:**

Section 102.3 "Repairs, additions or alterations to a structure, or changes of occupancy, shall be done in accordance with the procedures and provisions of the California Building Code, California Residential Code, California Energy Code, California Green Building Standards Code, California Historical Building Code, California Existing Building Code, California Fire Code, California Plumbing Code, California Mechanical Code, and California Electrical Code. Nothing in this code shall be construed to cancel, modify or set aside any provision of the Santa Rosa City Code."

**18-20.103.1 International Property Maintenance Code Section 103.1 is amended to read as follows:**

Section 103.1 "The Division of Building and Code Compliance is hereby created and the chief building official, building official or designated representative thereof shall be known as the code official."

**18-20.106.4 International Property Maintenance Code Section 106.4 is amended to read as follows:**

Section 106.4 "Violation penalties. Any person violating any of the provisions of this code, including but not limited to adopted model codes, as amended in this title, shall be subject to the penalty provisions of Section 1-28.010 of the Santa Rosa City Code."

**18-20.107.1 International Property Maintenance Code Section 107.1 is amended to read as follows:**

107.1 "Notice to person responsible. Whenever the code official determines that there has been a violation of this code or has grounds to believe that a violation has occurred, notice shall be given in the manner prescribed in section 107.2 and 107.3, or in the manner provided by Santa Rosa City Code sections 1-30.030 and 1-30.040, to the person responsible for the violation as specified in this code. Notices for condemnation procedures shall also comply with section 108.3."

**18-20.111 International Property Maintenance Code Section 111 and subsections are amended to read as follows:**

Section 111 "The Board of Building Regulation Appeals established in Section 18-04.050 of the Santa Rosa City Code, shall hear and determine any appeal arising from an action or determination made by the building official relative to the application and interpretation of this code. Section 18-04.060 of the City Code shall apply to the Board's determination. An appeal shall be filed, if at all, in accordance with the requirements and

within the time period set forth in Section 18-04.065 of the Santa Rosa City Code.

**18-20.112.4 International Property Maintenance Code Section 112.4, Failure to comply, is amended to read as follows:**

Section 112.4 "Any person who shall continue any work after having been served with a stop work order, except such work as that person is directed to perform to remove a violation or unsafe condition, shall be liable to a citation of not less than $100 or more than $500."

**18-20.201.3 International Property Maintenance Code Section 201.3, Terms defined in other codes, is amended to read as follows:**

Section 201.3 "Where terms are not defined in this code and are defined in the California Administrative Code, California Building Code, California Residential Code, California Green Building Standards Code, California Energy Code, California Historical Building Code, California Existing Building Code, California Fire Code, California Plumbing Code, California Mechanical Code, or California Electrical Code, such terms shall have the meanings ascribed to them as stated in those codes."

**18-20.302.4 International Property Maintenance Code Section 302.4, Weeds, paragraph number one, is amended to read as follows:**

302.4 "Weeds. Weed and rubbish abatement shall be as set forth in Santa Rosa City Code Title 9, Health and Safety, Chapter 9-08, Weeds and Rubbish."

**18-20.302.9 International Property Maintenance Code Section 302.9, Defacement of property, is deleted.**

**18-20.304.3 International Property Maintenance Code Section 304.3, Premise identification, is amended to read as follows:**

304.3 Premise identification. Premise identification shall be as set forth in Santa Rosa City Code Section 18-16.501.2.

**18-20.304.14 International Property Maintenance Code Section 304.14, Insect screens, is amended to read as follows:**

304.14 "Every door, window and other outside opening required for ventilation of habitable rooms, food preparation areas, food service areas or any areas where products to be included or utilized in food for human consumption are processed, manufactured, packaged or stored shall be supplied with approved tightly fitted screens of not less than 16 mesh per inch, and every screen door used for insect control shall have a self-closing device in good working condition.

Exception: Screens shall not be required where other approved means, such as air curtains or insect repellant fans, are employed."

**18-20.304.18 International Property Maintenance Code Section 304.18, Building security, is amended to read as follows:**

Section 304.18 "Building Security. Doors, windows or hatchways for dwelling units, room units or housekeeping units shall be provided with devices designed to provide security for the occupants and property within as set forth in the California Civil Code, Section 1941.3, or as set forth below, which ever is more restrictive."

**18-20.307 International Property Maintenance Code Section 307, Handrails and Guardrails, is amended to read as follows:**

Section 304.18 "General. Every exterior and interior flight of stairs shall have a handrail and guard per the requirements of the adopting code at the time the building was permitted. Handrails and guardrails shall be maintained in a safe and useful condition.

**18-20.401.3 International Property Maintenance Code Section 401.3, Alternative Devices, is amended to read as follows:**

Section 401.3 "Alternative devices. In lieu of the means for natural light and ventilation herein prescribed, artificial light or mechanical ventilation complying with the California Building Code or California Residential Code shall be permitted."

**18-20.502.5 International Property Maintenance Code Section 502.5, Public toilet facilities, is amended to read as follows:**

Section 502.5 "Public toilet facilities. Public toilet facilities shall be maintained in a safe sanitary and working condition in accordance with the California Plumbing Code. Except for periodic maintenance or cleaning, public access and use shall be provided to the toilet facilities at all times during occupancy of the premises."

**18-20.505.1 International Property Maintenance Code Section 505.1, General, is amended to read as follows:**

Section 505.1 "General. Every sink, lavatory, bathtub or shower, drinking fountain, water closet or other plumbing fixture shall be properly connected to either a public water system or to an approved private water system. All kitchen sinks, lavatories, laundry facilities, bathtubs and showers shall be supplied with hot or tempered and cold running water in accordance with the California Plumbing Code."

**18-20.602.2 International Property Maintenance Code Section 602.2, Residential occupancies, is amended to read as follows:**

602.2 "Residential occupancies. Interior spaces intended for human occupancy shall be

provided with heating facilities capable of maintaining a room temperature of 68 degrees F (20 C) in all habitable rooms."

**18-20.602.3 International Property Maintenance Code Section 602.3, Heat supply, Exceptions #1 and #2 are deleted.**

**18-20.602.4 International Property Maintenance Code Section 602.4, Occupiable work spaces, is deleted.**

**18-20.604.2 International Property Maintenance Code Section 604.2, Service, is amended to read as follows:**

Section 604.2 "Service. The size and usage of appliances and equipment shall serve as a basis for determining the need for additional facilities in accordance with the California Electrical Code. Dwelling units shall be served by a three-wire, 120/240 volt, single-phase electrical service having a rating of not less than 60 amperes."

**18-20.604.3.1.1 International Property Maintenance Code Section 604.3.1.1, Electrical equipment, is amended to read as follows:**

Section 604.3.1.1 "Electrical equipment. Electrical distribution equipment, motor circuits, power equipment, transformers, wire, cable, flexible cords, wiring devices, ground fault circuit interrupters, arc fault circuit interruptors, surge protectors, molded case circuit breakers, low-voltage fuses, luminaires, ballasts, motors and electronic control, signaling and communication equipment that have been exposed to water shall be replaced in accordance with the provisions of the California Electrical Code."

**18-20.604.3.2.1 International Property Maintenance Code Section 604.3.2.1, Electrical equipment, is amended to read as follows:**

Section 604.3.2.1 "Electrical equipment. Electrical switches, receptacles and fixtures, including furnace, water heating, security system and power distribution circuits, that have been exposed to fire, shall be replaced in accordance with the provisions of the California Building Code, or California Electrical Code."

**18-20.702.1 International Property Maintenance Code Section 702.1, General, is amended to read as follows:**

Section 702.1 "General. A safe, continuous and unobstructed path of travel shall be provided from any point in a building or structure to the public way. Means of egress shall comply with the California Fire Code, California Residential Code, or the California Building Code, which ever is more restrictive."

**18-20.702.2 International Property Maintenance Code Section 702.2, Aisles, is amended to read as follows:**

Section 702.2 "Aisles. The required width of aisles in accordance with the California Fire Code, California Residential Code, California Building Code, or Civil Code per 304.18, which ever is more restrictive, shall be unobstructed."

**18-20.702.3 International Property Maintenance Code Section 702.3, Locked doors, is amended to read as follows:**

Section 702.3 "Locked Doors. All means of egress doors shall be readily openable from the side from which egress is to be made without the need for keys, special knowledge or effort, except where the door hardware conforms to that permitted by the California Fire Code, California Building Code, or California Residential Code, which ever is more restrictive."

**18-20.704.1 International Property Maintenance Code Section 704.1. General, is amended to read as follows:**

Section 704.1 "General. All systems, devices and equipment to detect a fire, actuate an alarm, or suppress or control a fire or any combination thereof shall be maintained in an operable condition at all times in accordance with the California Fire Code."

**18-20.704.2 International Property Maintenance Code Section 704.2, Smoke alarms, is amended to read as follows:**

704.2 "Smoke alarms. Smoke alarms shall be installed and maintained in accordance with the California Fire Code, California Residential Code, or the California Building Code, which ever is more restrictive."

**Section 6.** A new Chapter is hereby created by this ordinance to be numbered 18-22. This Chapter is titled "California Residential Code." Unless amended or deleted all of the California Residential Code is adopted and shall apply, as applicable, to the model codes herein adopted.

**18-22.010 Citation of sections.**
"For purposes of citation, the California Residential Code, Part 2.5 of Title 24, 2010 Edition, published by the International Code Council, as amended by the California Building Standards Commission, and Appendix H, Patio Covers, adopted by reference and amended by the City, are renumbered by adding "18-22." before each section."

**Section 18-22.R105.2 California Residential Code, Section R105.2, Work Exempt from Permit, Item #3 is amended to read as follows:**

Section R105.2 – "Item #3. Retaining walls that are not over 4 feet in height measured from the bottom of the footing to the top of the wall, unless supporting a surcharge or impounding Class I, II, or IIIA liquids, and retaining walls with a height from bottom of footing to the top of the retaining wall that does not exceed the distance from property line to the face of the retaining wall."

**Section 18-22.R105.3.2 California Residential Code, Section R105.3.2, Time limit of application, is amended to read as follows:**

Section R105.3.2 "Expiration of permit application and plan review shall be determined as set forth in Section 18-08.050 of the Santa Rosa City Code."

**Section 18-22.R105.5 California Residential Code, Section R105.5, Expiration, is amended to read as follows:**

Section R105.5 "Expiration of an issued permit shall be determined as set forth in Section 18-08.060 of the Santa Rosa City Code."

**Section 18-22.R313.1 – California Residential Code, Section R313.1 Exception is amended to read as follows:**

**Section R313.1 "Exception –**

**1. Additions** Additions to existing buildings that increase square feet (based on the following percentages) calculated by the existing gross floor area shall meet the automatic fire sprinkler requirements for a newly constructed building:

| Square Feet | Increase |
|---|---|
| 0-1000 sq ft: | 200% or 2000 sq ft. maximum cumulative total |
| 1001-4000 sq ft: | 100% |
| > 4000 sq ft: | 50%" |

**2. Alterations or Repairs.** "For alterations or repairs to existing building(s) involving demolition, removal, or repair of more than 50% of the structure, the building shall meet the automatic fire sprinkler requirements for a newly constructed building.

Exception: Alterations or additions made solely for the purpose of complying with the American's with Disabilities Act."

**Section 18-22.R313.2 – California Residential Code, Section R313.2 Exception is amended to read as follows:**

**Section R313.2 "Exception –**

**1. Additions** Additions to existing buildings that increase square feet (based on the following percentages) calculated by the existing gross floor area shall meet the automatic fire sprinkler requirements for a newly constructed building:

| Square Feet | Increase |
|---|---|
| 0-1000 sq ft: | 200% or 2000 sq ft. maximum cumulative total |
| 1001-4000 sq ft: | 100% |

| | |
|---|---|
| > 4000 sq ft: | 50%" |

**2. Alterations or Repairs.** "For alterations or repairs to existing building(s) involving demolition, removal, or repair of more than 50% of the structure, the building shall meet the automatic fire sprinkler requirements for a newly constructed building.

Exception: Alterations or additions made solely for the purpose of complying with the American's with Disabilities Act."

**Section 18-22.R908 – California Residential Code, Section R908 is added to read as follows:**

**Section R908 "Roof Mounted photovoltaic panels/modules.** Roof Mounted photovoltaic panels/modules shall comply with the requirements of the California Electrical Code and the California Fire Code as amended."

**Section 7.** The existing sections of Chapter 18-24, California Plumbing Code, that are not repealed or amended by this ordinance are readopted and shall apply, as applicable, to the model codes herein adopted.

**18-24.010 Citation of sections.**
"This Chapter shall be known as the "California Plumbing Code," and may be cited as such. For purposes of citation, the California Plumbing Code, Part 5 of Title 24, 2010 Edition, published by the International Association of Plumbing and Mechanical Officials including IAPMO Installation Standards, and Appendix A, Recommended Rules for Sizing the Water Supply System; Appendix B, Explanatory Notes on Combination Waste and Vent Systems; Chapter D, Sizing Storm Water Drainage Systems; Appendix G, Graywater Systems; Appendix I, Installation Standards; and Appendix L, Alternate Plumbing Systems, as amended by the California Building Standards Commission, adopted by reference and amended by the City, are renumbered by adding "18-24." before each section."

**Section 18-24.1.8.8 California Plumbing Code Section 1.8.8, Board of Appeal, is amended to read as follows:**

Section 1.8.8 "The Board of Building Regulation Appeals, established in Section 18-04.050 of the Santa Rosa City Code, shall hear and determine any appeal arising from an action or determination made by the building official relative to the application and interpretation of this code. Section 18-04.060 of the City Code shall apply to the Board's determination. All appeals shall be filed in accordance with the requirements and within the time period set forth in Section 18-04.065 of the Santa Rosa City Code."

**Section 18-24.102.3.2 California Plumbing Code, Subsection 102.3.2 is amended to read as follows:**

Section 102.3.2 "Penalties. Any person violating any of the provisions of this code, including but not limited to adopted model codes, as amended in this title, shall be subject to the penalty provisions of Section 1-28.010 of the Santa Rosa City Code."

**Section 18-24.103.1.2 California Plumbing Code, Section 103.1.2, Work Exempt from Permit, is amended by adding new subsection:**

Section 103.1.2.3 "The replacement of lavatory and sink faucets, shower heads, water closets, or urinals that comply with or exceed the water conservation program requirements of the City of Santa Rosa Utilities Department or criteria set forth in California Code of Regulations Title 20, Chapter 2, and Health and Safety Code Section 17921.3. This provision applies only to installations that do not require the rearrangement of valves, pipes or fixtures."

**Section 18-24.103.3.4 California Plumbing Code, Section 103.3.4, Expiration, is amended to read as follows:**

Section 103.3.4 "Expiration of issued permit shall be determined as set forth in Section 18-08.060 of the Santa Rosa City Code."

**Section 18-24.103.4.1 California Plumbing Code, Section 103.4.1, Fees, is amended to read as follows:**

Section 103.4.1 "Fees shall be determined as set forth in Section 18-08.130 of the Santa Rosa City Code."

**Section 18-24.103.4.2 California Plumbing Code, Section 103.4.2, Fees, is amended to read as follows:**

Section 103.4.2 "Fees shall be determined as set forth in Section 18-08.130 of the Santa Rosa City Code."

**Section 18-24.103.4.3 California Plumbing Code, Section 103.4.3 is amended to read as follows:**

Section 103.4.3 "Expiration of permit application and plan review shall be determined as set forth in Section 18-08.050 of the Santa Rosa City Code."

**Section 18-24.103.4.4.2 California Plumbing Code, Section 103.4.4.2 is amended to read as follows:**

Section 18-24.1.3.4.4.2 "Fees shall be determined as set forth in Section 18-08.130 of the Santa Rosa City Code."

**Sections 18-24.108.4.2 through 18-24.A103.4.4.2 of Santa Rosa City Code are deleted.**

**Section 18-24.412.1 Santa Rosa City Code Section 18-24.412.1, Plumbing Fixtures, is deleted.**

**Section 8.** The existing sections of Chapter 18-32, California Electrical Code, that are not repealed or amended by this ordinance are readopted and shall apply, as applicable, to the model codes herein adopted.

**18-32.010 Citation of sections.**
"This Chapter shall be known as the "California Electrical Code," and may be cited as such. For purposes of citation, the California Electrical Code, Part 3 of Title 24, 2010 Edition, published by the National Fire Protection Association and amended by the California Building Standards Commission, including tables, and Annex H, Administration and Enforcement; thereto adopted by reference and amended by the City, is renumbered by adding "18-32." before each section."

**Section 18-32.89.108.4.3 California Electrical Code Article 89.108.4.3 is amended to read as follows:**

Section 89.108.4.3 "Expiration of permit application and plan review shall be determined as set forth in Section 18-08.050 of the Santa Rosa City Code."

**Section 18-32.89.108.8 California Electrical Code, Article 89.108.8 and all subsections, Appeals Board, is amended to read as follows:**

Section 89.108.8 "The Board of Building Regulation Appeals, established in Section 18-04.050 of the Santa Rosa City Code, shall hear and determine any appeal arising from an action or determination made by the building official relative to the application and interpretation of this code. Section 18-04.060 of the City Code shall apply to the Board's determination. All appeals shall be filed in accordance with the requirements and within the time period set forth in Section 18-04.065 of the Santa Rosa City Code."

**Section 18-32.H80.15. California Electrical Code, Annex H, Article 80.15, Electrical Board, and all subsections, are deleted.**

**Section 18-32.H80.19(H)(1) California Electrical Code, Annex H, Article 80.19(H)(1), Applications and Extensions, is amended to read as follows:**

Article 80.19(H)(1) "Expiration of plan review shall be determined as set forth in Section 18-08.050 of the Santa Rosa City Code; and Expiration of issued permit shall be determined as set forth in Section 18-08.060 of the Santa Rosa City Code."

**Section 18-32.H80.23B California Electrical Code, Annex H, Article 80.23B, is amended to read as follows:**

Article 80.23B "Penalties. Any person violating any of the provisions of this code, including but not limited to adopted model codes, as amended in this title, shall be subject to the penalty provisions of Section 1-28.010 of the Santa Rosa City Code."

**Section 18-32.H80.27. California Electrical Code, Annex H, Article 80.27, Inspector's Qualifications, and all subsections, are deleted.**

**Sections 18-32.108.4.3 through 18-32.G80.27 of the Santa Rosa City Code are deleted.**

**Section 9.** The existing sections of Chapter 18-33, California Energy Code, that are not repealed or amended by this ordinance are readopted and shall apply, as applicable, to the model codes herein adopted.

**18-33.010 Citation of Sections**
"This chapter shall be known as the "California Energy Code," and may be cited as such. For purposes of citation, the California Energy Code, Part 6 of Title 24, 2010 Edition, published by the International Code Council, Inc. and the California Building Standards Commission, including tables and appendices thereto adopted by reference by the City, are renumbered by adding "18-33" before each section."

**Section 10.** The existing Chapter 18-34 of the Santa Rosa City Code, Local Energy Efficiency Standards, and chapter 21-09, Green Building, are repealed.

**Section 11.** The existing sections of Chapter 18-36, California Mechanical Code, that are not repealed or amended by this ordinance are readopted and shall apply, as applicable, to the model codes herein adopted.

**18-36.010 Citation of sections.**
"This chapter shall be known as the "California Mechanical Code," and may be cited as such. For purposes of citation, the California Mechanical Code, Part 4 of Title 24, 2010 Edition, published by the International Association of Plumbing and Mechanical Officials and the California Building Standards Commission, including tables and Appendix A, Uniform Mechanical Code Standards as amended by the California Building Standards Commission and adopted by reference and amended by the City, are renumbered by adding "18-36." before each section."

**Sections 18-36.108.4.2 through 18-36.A1.115 of the Santa Rosa City Code are deleted.**

**Section 18-36.110.0 California Mechanical Code, Section 110.0, Board of Appeal, is amended to read as follows:**

> Section 110.0 "The Board of Building Regulation Appeals, established in Section 18-04.050 of the Santa Rosa City Code, shall hear and determine any appeal arising from an action or determination made by the building official relative to the application and interpretation of this code. Section 18-04.060 of the City Code shall apply to the Board's determination. All appeals shall be filed in accordance with the requirements and within the time period set forth in Section 18-04.065 of the Santa Rosa City Code."

**Section 18-36.114.4 California Mechanical Code, Section 114.4, Expiration, is amended to read as follows:**

Section 114.4 "Expiration of issued permit shall be determined as set forth in Section 18-08.060 of the Santa Rosa City Code."

**Section 18-36.115. California Mechanical Code Section 115 is amended to read as follows:**

Section 115 "Fees shall be determined as set forth in Section 18-08.130 of this code."

**Section 18-36.115.4 California Mechanical Code Section 115.4 is amended to read as follows:**

Section 115.4 "Expiration of permit application and plan review shall be determined as set forth in Section 18-08.050 of the Santa Rosa City Code."

**Section 12.** The existing sections of Chapter 18-40, Existing Building Code, that are not repealed or amended by this ordinance are readopted and shall apply, as applicable, to the model codes herein adopted.

**18-40.010 Citation of sections.**
"This Chapter shall be known as the "California Existing Building Code," and may be cited as such. For purposes of citation, the California Existing Building Code, Part 10 of Title 24, 2010 Edition, including Appendix C, published by the International Code Council and the California Building Standards Commission, as adopted by the California Building Standards Commission and adopted by reference by the City, are renumbered by adding "18-40." before each section."

**Section 13.** A new Chapter is hereby created by this ordinance to be numbered 18-42. This section shall be titled "The California Green Building Standards Code". Unless amended or deleted the California Green Building Standards Code is adopted and shall apply, as applicable to the model codes herein adopted.

**18-42.010 Citation of sections.**
"This Chapter shall be known as the "California Green Building Standards Code," and may be cited as such. For purposes of citation, the California Green Building Standards Code, Part 11 of Title 24, 2010 Edition, published by the International Code Council, as amended by the California Building Standards Commission, including Appendix Chapter A4, Residential Voluntary Measures at Tier I level and Appendix Chapter A5, Nonresidential Voluntary Measures at Tier I level, are adopted by reference and amended by the City of Santa Rosa, and are renumbered by adding "18-42." before each section."

**Section 14.** The existing sections of Chapter 18-48, Review and Abatement of Existing Buildings, are deleted by this ordinance, and are replaced with the following:

"**18-48.010 Purpose.**

(A) It is generally acknowledged that the City of Santa Rosa has experienced and will continue

to experience moderate to great earthquakes in the foreseeable future.

(B) Many buildings subject to severe earthquake hazards continue to be a serious danger to the life and safety of people who live and work in them in the event of an earthquake. The primary goal of building construction to reduce earthquake hazards is the improvement of safety to life during a seismic event. In order to make reconstruction economically feasible and to improve the safety of life in seismically hazardous buildings, the City adopted standards in Resolution 9820 in 1971 which was later repealed and reenacted in certain parts as set forth in this chapter.

**18-48.020 Evaluation of Existing Buildings.**

(A) This Chapter provides procedures for the systematic evaluation and reconstruction of existing buildings within the City to make reconstruction economically feasible and to improve the safety of life in seismically hazardous buildings.

(B) The following classifications of buildings are subject to evaluation to determine their general structural characteristics, relative safety of the building, and general compliance with this chapter:

(1) All buildings constructed before December 31, 1957, except public school buildings and one- and two-family wood frame dwellings (except as indicated in subsection (B)(6) of this section);
(2) All buildings constructed with unreinforced masonry walls;
(3) Connection of diaphragms in all buildings constructed with concrete or masonry walls regardless of when built;

(a) Thresholds for requiring evaluation of diaphragm to wall connection:
(i) At time of reroof permit application,
(ii) Change in type of use as a condition of granting use permit,
(iii) Remodel or additions 10 percent or more of the existing building
(iv) When fire sprinklers are required by code or local ordinances;

(4) Suspension of lighting fixtures in suspended grid ceilings in all buildings regardless of when built;

(a) Thresholds for requiring suspension wires for lights fixtures:
(i) Changes in use as a condition of use permit,
(ii) Remodels of existing tenant space;

(5) All buildings, regardless of when built that do not meet the building benchmark criteria of ASCE 31-03, Table 3-1.
(6) Existing two-story wood frame houses with second story construction over garage door opening(s) creating a "soft story" situation.

(a) Thresholds for required lateral bracing of soft story shall be:

(i) Remodel or addition to garage or second story over the garage regardless of cost; or
(ii) Any remodel or addition to the dwelling exceeding $50,000.00.

**18-48.030 Scope of Evaluation Report.**

(A) The building owner or his authorized representative shall retain a licensed design professional to conduct an evaluation of the existing building and submit an evaluation report which may include, but not be limited to the following:

(1) Location by street address and Assessor's parcel number;
(2) Type of occupancy and approximate dimensions;
(3) Type of construction, structural system (framing, lateral-force-resisting system, floor and roof diaphragm construction and foundation system) and type of materials used in construction;
(4) Age of construction; photos of the building exterior; construction drawings shall be submitted if available;
(5) Quality of maintenance, cracks and cleanliness; evidence of leaks, foundation settlement, sagging floors or rusting metal and rotting wood; general deterioration of any other building material used;
(6) General fire classification of the structure; the classification shall include the frame, walls, partitions, floors, roofs and roof coverings;
(7) Number, quality and type of exits available;
(8) Nonstructural systems description (all nonstructural elements that affect seismic performance)
(9) Performance level
(10) Soil type. Site D shall be used. Where deemed by the building official a site-specific geotechnical report is not required where prior evaluations of nearby sites with similar soil conditions provide sufficient information.

(B) The report shall include the determination that the building either complies or does not comply with the requirements of the Uniform Building Code, 1955 Edition, including earthquake provisions (applicable only to buildings constructed prior to 1958), or the benchmark building criteria identified in ASCE 31-03, Table 3-1. If the building is determined to comply, it is exempt from the provisions of this chapter.

(C) If the building is determined not to comply with the Uniform Building Code or is deficient according to the benchmark building criteria of ASCE 31-03, recommendations shall be included to mitigate noncompliance/deficiencies through reconstruction.

(D) The report shall also include if the building complies with the fire and panic requirements of the code in effect at time of construction or current code concerning exit requirements, enclosed stairways, fire sprinkler systems, fire separations, and panic hardware. The building official may require that the building will have to be upgraded to correct identified deficiencies.

**18-48.040 Abatement—Rehabilitation or demolition.**

Those buildings not meeting the requirements this chapter may be abated by demolition or rehabilitation in accordance with the provisions of this chapter. Buildings or hazards which are not voluntarily abated within 365 days of notice to correct deficiencies may be required by the City to be vacated and abated in accordance with the provisions of the 2009 International Property Maintenance Code

**18-48.050 Requirements for continued use of structure.**

Reinforcement design and work shall be performed under the direct supervision of a registered design professional, to include but not be limited to the following standards:

- 2010 California Building Code Title 24, Part 2-Chapter 34 Existing Structures
- 2010 California Historical Building Code Title 24, Part 8
- ASCE 41-09 Seismic Rehabilitation of Existing Buildings
- Any other national recognized standard for rehabilitation of existing buildings approved by the building official.
- The following criteria may be used for buildings to complete their compliance requirements if they have had a previously permitted phased or partial upgrade;

(A) The vertical dead load (without live or lateral loads) must not create any overstress as related to allowed stresses pursuant to this chapter, except that foundations may be assumed to have met the test of time where there is no settlement or damage;

(B) The building must meet the requirements of this chapter for vertical forces including live load with no more than 15 percent overstress above current codes;

(C) Walls, parapets, windows and doors must be adequate for a 15 pound wind, 20 percent G on walls, 50 percent G on parapets both in spanning between resisting elements and attachments to supporting elements with no more than 50 percent increase to stresses in lieu of the presently allowed 33 percent increase;

(D) Diaphragms must be capable of resisting present code required lateral forces at not over 100 percent increase in normal code values (base plus 100 percent in place of base plus 33 percent). Straight sheathed diaphragms shall not be used to resist lateral forces in concrete or masonry buildings. Chords and collector elements must be provided;

(E) Shear walls must be adequately connected and tied down to foundations. Unreinforced masonry may be used in shear parallel to plane of wall provided that wall is securely held in place perpendicular to wall."

**Section 15.** The existing sections of Chapter 18-64, Historical or Architecturally Significant Buildings, that are not repealed or amended by this ordinance are readopted and shall apply, as applicable, to the model codes herein adopted.

**Section 18-64.010 of the Santa Rosa City Code, Purpose - is amended to read as follows:**

> "**Purpose.** In order to maintain the historical and architectural integrity of buildings designated as historical or architecturally significant buildings within the community consistent with objectives of the urban design element of the General Plan, it is necessary to provide necessary code alternatives of rehabilitation and restoration of such buildings. Such alternative building regulations are intended to facilitate the restoration or changes of occupancy so as to preserve the original or restored architectural elements and features, to provide a cost-effective approach to the preservation of historical or architecturally significant buildings and to provide for the safety of the building occupants consistent with the Title 24, Part 8, of the 2010 California Historical Building Code."

**Section 16.** Findings of Fact. The Council finds that the standards for buildings within the City of Santa Rosa should comply with the CALIFORNIA ADMINISTRATIVE CODE, 2010 Edition; CALIFORNIA BUILDING CODE, 2010 Edition; CALIFORNIA RESIDENTIAL CODE, 2010 Edition; the CALIFORNIA HISTORICAL BUILDING CODE, 2010 Edition; the CALIFORNIA EXISTING BUILDING CODE, 2010 Edition; the CALIFORNIA ELECTRICAL CODE, 2010 Edition; the CALIFORNIA PLUMBING CODE, 2010 Edition; the CALIFORNIA MECHANICAL CODE, 2010 Edition; the CALIFORNIA ENERGY CODE, 2010 Edition; the CALIFORNIA GREEN BUILDING STANDARDS CODE, 2010 Edition; all as amended and adopted by the State of California and further amended by this Ordinance; the INTERNATIONAL PROPERTY MAINTENANCE CODE, 2009 Edition, as further amended by this Ordinance. Based on materials presented by the Chief Building Official of the City of Santa Rosa, the Council finds that it is necessary to make procedural and administrative modifications and changes to the model codes as amended and adopted by the State of California and specifically adopted and amended in this Ordinance. Such standards are needed for efficient, economical, and expeditious enforcement of the Buildings and Construction of the Santa Rosa City Code, Chapter 18. The Council further finds and determines, based on the materials and reports presented, that the substantive amendments to the model codes, which are identified by and adopted in this Ordinance, are hereby determined to be reasonably necessary because of local climatic, geological or topographical conditions and do not lessen, diminish or change the standards set forth within the model codes except as authorized by law. If any non-administrative or non-procedural model code provision or applicable State of California amendment is in conflict with this ordinance, it is the intent of this ordinance to amend or delete such provision when findings of local conditions are stated as required by sections 17958.5 and 17958.7 of the Health and Safety Code.

Said local conditions are:

A. Earthquake hazards associated with the Healdsburg-Rodgers Creek Fault and other localized earthquake faults in close proximity of a densely populated urban area.

B. History of heavy winter rains and poorly drained soils including expansive adobe soils in many locations.

C. High groundwater tables and unconsolidated alluvial soils.

D. Heavy accumulations of flammable plant material covering many areas, periodic high winds and an extended dry season.

E. The propensity of local streams to flood due to periods of intense rainfall.

F. Santa Rosa is an inland city that discharges treated reclaimed water in three ways: to urban and agricultural irrigation, to the Russian River during certain period of the year at a rate based on the flow of the river, and pumped to the Geysers hydrothermal field.

G. Santa Rosa has established goals for green house gas reduction. The construction of new structures has a direct impact on green house gas emissions for climate control.

Such local conditions apply to local amendments and modifications to the State of California adopted model codes as indicated below:

| | |
|---|---|
| SRCC 18-16.105 | B, C |
| SRCC 18-22.R105.2 | B, C |
| SRCC 18-16.1803 | B, C |
| SRCC 18-16.512 | A, D |
| SRCC 18-16.903 – 907 | A, D |
| SRCC 18-16.J103-J105 | A, B, C, D, E |
| SRCC 18-20. | B, D |
| SRCC 18-24.103.1.2 | F |
| SRCC 18-42 | G |
| SRCC 18-48 | A |

**Section 17.** Environmental Review. The Council determines that this ordinance establishes procedures for issuing permits and is not a project, and, therefore, is not subject to the California Environmental Quality Act. The Council further finds that the adoption of this ordinance is exempt from CEQA under the provisions of State CEQA guidelines, section 15061 (b) (3), in that there is no possibility that the provisions enacted by this ordinance will effect a substantial adverse change in the environment.

**Section 18.** Duty. Notwithstanding any provision contained in Title 18 of the Santa Rosa City Code, whenever the words "shall", "will", "must", "is charged with the enforcement of", or words of similar import, are used in said chapters to establish a responsibility of the City of Santa Rosa, or of the members of any board, commission, department, officers of the City, including, but not limited to the Council and City Planning Commission thereof, or of any officer, official, or employee of the City of Santa Rosa, it is the legislative intent that such words shall establish a discretionary authority or power requiring the exercise of judgment and discretion, as distinguished from a mandatory duty. No mandatory duty is imposed upon any member of the Council, or upon any board or commission of the City of Santa Rosa, or upon any department, officer, official, or employee of the City of Santa Rosa by the provisions of said chapters, and

said chapters shall not be construed so as to hold the City of Santa Rosa or any member of the Council or of any board, commission, or department of the City, or any officer, official or employee of the City of Santa Rosa responsible or liable for any damage to persons or property by reason of any action taken or by reason of any approval given or not given, under the provisions of said chapters or in connection with any such members, officers, or employees duties set forth in said chapters.

**Section 19.** Severability. If any section, subsection, sentence, clause, or phrase of this ordinance is for any reason held to be unconstitutional, such decision shall not affect the remaining portions of this ordinance. The Council declares that it would have passed this ordinance and each section, subsection, clause or phrase thereof, irrespective of the fact that any one or more sections, subsections, clauses or phrases be declared unconstitutional.

**Section 20.** Effective Date. This ordinance shall take effect upon passage by the Council and publication pursuant to Section 8 of the Santa Rosa City Charter. The existing non-administrative or non-procedural provisions of this Title shall remain in effect as applicable to specific permit applications as of the date of submittal for plan review when such date of submittal is prior to the effective date of this ordinance. For purposes of this section, the date of submittal for master planned projects shall be the date of submittal for plot plan review.

IN COUNCIL DULY PASSED this 19th day of October, 2010

AYES (6) Mayor Gorin, Vice Mayor Wysocky, Councilmembers Bender, Sawyer, Jacobi and Vas Dupre

NOES: (0)

ABSENT: (1) Councilmember Olivares

ABSTAIN: (0)

ATTEST: _____
City Clerk

APPROVED: _____
Mayor

APPROVED AS TO FORM:

_____
City Attorney

# Climate Zone 2 Energy Cost-Effectiveness Study

# Codes and Standards
# Title 24 Energy-Efficient Local Ordinances

## Title:
## Climate Zone 2
## Energy Cost-Effectiveness Study

**Prepared for:**

Pat Eilert
Codes and Standards Program
Pacific Gas and Electric Company

Maril Pitcock
Government Partnership Program
Pacific Gas and Electric Company

**Prepared by:**
Gabel Associates, LLC

Last Modified: September 30, 2010

# Climate Zone 2 Energy Cost-Effectiveness Study

September 30, 2010

Report prepared by:
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Report on behalf of:
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## LEGAL NOTICE

***Table of Contents***

# 1.0 Executive Summary

This report presents the results of Gabel Associates' research and review of the feasibility and energy cost-effectiveness of building permit applicants exceeding the 2008 Building Energy Efficiency Standards to meet the minimum energy-efficiency requirements of local energy efficiency standards covering **Climate Zone 2**. A local government may use this report as a basis for demonstrating energy cost-effectiveness of a proposed green building or energy ordinance. The study assumes that such an ordinance requires, for the building categories covered, that building energy performance exceeds the 2008 TDV energy standard budget by at least 15%.

The study is also contained in the local government's application to the California Energy Commission (CEC) which must meet all requirements specified in Section 10-106 of the California Code of Regulations, Title 24, Part 1, Article 1: Locally Adopted Energy Standards. An ordinance shall be legally enforceable (a) after the CEC has reviewed and approved the local energy standards as meeting all requirements of Section 10-106; and (b) the ordinance has been adopted by the local government and filed with the Building Standards Commission.

The 2008 Building Energy Efficiency Standards, which took effect on January 1, 2010, are the baseline used to calculate the cost-effectiveness data.

## 2.0 Methodology and Assumptions

The energy performance impacts of exceeding the performance requirements of the 2008 Title 24 Building Energy Efficiency Standards (2008 Standards) have been evaluated in **Climate Zone 2** using the following residential and nonresidential prototypical building types:

| | |
|---|---|
| **Small Single Family House**<br>2-story<br>2,025 sf | **Large Single Family House**<br>2-story<br>4,500 sf |
| **Low-rise Multi-family Apartments**<br>8 dwelling units/2-story<br>8,442 sf | **High-rise Multi-family Apartments**<br>40 dwelling units/4-story<br>36,800 sf |
| **Low-rise Office Building**<br>1-story<br>10,580 sf | **High-rise Office Building**<br>5-story<br>52,900 sf |

### Methodology

The methodology used in the case studies is based on a design process for each of the proposed prototypical building types that first meets the minimum requirements and then exceeds the 2008 Standards by 15%. The process includes the following major stages:

***Stage 1: Minimum Compliance with 2008 Standards:***

Each prototype building design is tested for minimum compliance with the 2008 Standards, and the mix of energy measures are adjusted using common construction options so the building first just meets the Standards. The set of energy measures chosen represent a reasonable combination which reflects how designers, builders and developers are likely to achieve a specified level of performance using a relatively low first incremental (additional) cost.

***Stage 2: Incremental Cost for Exceeding 2008 Standards by 15%:***

Starting with that set of measures which is minimally compliant with the 2008 Standards, various energy measures are upgraded so that the building just exceeds the 2008 Standards by 15%. The design choices by the consultant authoring this study are based on many years of experience with architects, builders, mechanical engineers; and general knowledge of the relative acceptance and preferences of many measures, as well as their incremental costs. This approach tends to reflect how building energy performance is typically evaluated for code compliance and how it's used to select design energy efficiency measures. Note that lowest simple payback with respect to building site energy is not the primary focus of selecting measures; but rather the requisite reduction of Title 24 Time Dependent Valuation(TDV) energy at a reasonable incremental cost consistent with other non-monetary but important design considerations. A minimum and

maximum range of incremental costs of added energy efficiency measures is established by a variety of research means. A construction cost estimator, Building Advisory LLC, was contracted to conduct research to obtain current measure cost information for many energy measures; and Gabel Associates performed its own additional research to establish first cost data.

***Stage 3: Cost Effectiveness Determination:***

Energy savings in kWh and therms is calculated from the Title 24 simulation results to establish the annual energy cost savings and $CO_2$-equivalent reductions in greenhouse gases. A simple payback analysis in years is calculated by dividing the incremental cost for exceeding the 2008 Standards by the estimated annual energy cost savings.

## Assumptions

### *Annual Energy Cost Savings*

1. Annual site electricity (kWh) and natural gas (therms) saved are calculated using Micropas 8, state-approved energy compliance software for the 2008 Building Energy Efficiency Standards.

2. Average residential utility rates of $0.18/kWh for electricity and $1.15/therm for natural gas in current constant dollars; nonresidential rates are time-of-use rate schedules modeled explicitly in the DOE-2.1E computer simulation: PG&E A-6 schedule for electricity and PG&E G-NR1 schedule for natural gas.

3. No change (i.e., no inflation or deflation) of utility rates in constant dollars

4. No increase in summer temperatures from global climate change

### *Simple Payback Analysis*

1. No external cost of global climate change -- and corresponding value of additional investment in energy efficiency and $CO_2$ reduction – is included

2. The cost of money (e.g., opportunity cost) invested in the incremental cost of energy efficiency measures is not included.

## 3.0 Minimum Compliance with 2008 Standards

The following energy design descriptions of the following building prototypes just meet the 2008 Standards in Climate Zone 2.

**Small Single Family House**

- 2,025 square feet
- 2-story
- 20.2% glazing/floor area ratio

***Base Case Design With No Air Conditioner***

| Energy Efficiency Measures |
|---|
| R-38 Roof w/ Radiant Barrier |
| R-13 Walls |
| R-19 Raised Floor over Garage/Open at 2nd Floor |
| R-0 Slab on Grade |
| Low E2 Vinyl Windows, U=0.36, SHGC=0.30 |
| Furnace: 80% AFUE |
| Air Conditioner: None |
| R-6 Attic Ducts |
| 50 Gallon Gas Water Heater: EF=0.62 |

***Base Case Design With Air Conditioner***

| Energy Efficiency Measures |
|---|
| R-30 Roof w/ Radiant Barrier |
| R-13 Walls |
| R-19 Raised Floor over Garage/Open at 2nd Floor |
| R-0 Slab on Grade |
| Low E2 Vinyl Windows, U=0.36, SHGC=0.30 |
| Furnace: 80% AFUE |
| Air Conditioner: 13 SEER, 11 EER (HERS) |
| Air Conditioner: Refrigerant Charge (HERS) |
| R-6 Attic Ducts |
| 50 Gallon Gas Water Heater: EF=0.62 |

**Large Single Family House**

- 4,500 square feet
- 2-story
- 22.0% glazing/floor area ratio

***Base Case Design With No Air Conditioner***

| Energy Efficiency Measures |
|---|
| R-30 Roof w/ Radiant Barrier |
| R-13 Walls |
| R-19 Raised Floor |
| Low E2 Vinyl Windows, U=0.36, SHGC=0.30 |
| (2) Furnaces: 80% AFUE |
| Air Conditioner: None |
| R-6 Attic Ducts |
| Reduced Duct Leakage/Testing (HERS) |
| (2) 50 Gallon Gas Water Heaters: EF=0.60 |

***Base Case Design With Air Conditioner***

| Energy Efficiency Measures |
|---|
| R-38 Roof w/ Radiant Barrier |
| R-13 Walls |
| R-19 Raised Floor |
| Low E2 Vinyl Windows, U=0.36, SHGC=0.30 |
| (2) Furnaces: 80% AFUE |
| (2) Air Conditioners: 13 SEER |
| R-6 Attic Ducts |
| Reduced Duct Leakage/Testing (HERS) |
| (2) 50 Gallon Gas Water Heaters: EF=0.62 |

**Low-rise Multi-family Apartments**

- 8,442 square feet
- 8 units/2-story
- 12.5% glazing/floor area ratio

***Base Case Design With No Air Conditioner***

| Energy Efficiency Measures |
|---|
| R-30 Roof w/ Radiant Barrier |
| R-13 Walls |
| R-0 Slab on Grade |
| Low E2 Vinyl Windows, U=0.36, SHGC=0.30 |
| (8) Furnaces: 80% AFUE |
| Air Conditioner: None |
| R-6 Attic Ducts |
| (8) 40 Gallon Gas Water Heaters: EF=0.63 |

***Base Case Design With Air Conditioner***

| Energy Efficiency Measures |
|---|
| R-38 Roof w/ Radiant Barrier |
| R-13 Walls |
| R-0 Slab on Grade |
| Low E2 Vinyl Windows, U=0.36, SHGC=0.30 |
| (8) Furnaces: 80% AFUE |
| (8) Air Conditioner: 13 SEER |
| R-8 Attic Ducts |
| (8) 40 Gallon Gas Water Heaters: EF=0.63 |

## High-rise Multifamily Apartments

- 36,800 sf,
- 40 units
- 4-story
- Window to Wall Ratio = 35.2%

| Energy Efficiency Measures to Meet Title 24 |
|---|
| R-19 Metal Roof w/ R-10 (2") rigid insulation; cool roof Reflectance = 0.55 Emittance = 0.75 |
| R-19 in Metal Frame Walls |
| R-4 (1.25" K-13 spray-on) Raised Slab over parking garage |
| Dual Metal Windows: COG U-factor=0.30, COG SHGC=.54 |
| 2 ton 4-pipe fan coil, 84% AFUE boiler, 70-ton scroll air cooled chiller 0.72 KW/ton |
| Central DHW boiler: 84% AFUE and recirculating system w/ timer-temperature controls with variable speed pump |

## Low-rise Office Building

- Single Story
- 10,580 sf,
- Window to Wall Ratio = 37.1%

| Energy Efficiency Measures to Meet Title 24 |
|---|
| R-19 under Metal Deck with 3" rigid (R-15) above |
| R-19 in Metal Frame Walls |
| R-0 (un-insulated) slab-on-grade 1st floor |
| Metal windows: COG U=0.30, COG SHGC=0.54 |
| Lighting = 0.858 w/sf: Open Office Areas: (60) 2-lamp T8 fixtures @58w each; (24) 18w recessed CFLs no lighting controls. Small Offices: (48) 2-lamp T8 fixtures; (40) 18w recessed CFLs, on/off lighting controls. Support Areas: (32) 18w recessed CFLs; (48) 13w CFL wall sconces; no controls. |
| (3) 10-ton DX units EER=11.1; 82% AFUE furnaces; standard efficiency fan motors; fixed temp. integrated air economizers |
| R-6 duct insulation w/ducts on roof, HERS verified duct leakage |
| (1) Tank Gas Water Heaters EF=0.58 |

**High-rise Office Building**

- 5-story
- 52,900 sf,
- Window to Wall Ratio = 34.5%

| Energy Efficiency Measures to Meet Title 24 |
|---|
| R-19 under Metal Deck with 2" rigid insulation above (R-10), Cool Roof Reflectance = 0.55, Emittance = 0.75 |
| R-19 in Metal Frame Walls |
| R-0 (un-insulated) slab-on-grade 1st floor |
| Metal windows: Default glazing U=0.71, SHGC = .73 |
| Lighting = 0.858 w/sf: Open Office Areas: (300) 2-lamp T8 fixtures @58w each; no lighting controls; (120) 18w recessed CFLs no lighting controls. Small Offices: (280) 2-lamp T8 58w fixtures on/off lighting controls; (200) 18w recessed CFLs no lighting on/off lighting controls. Support Areas: (160) 18w recessed CFLs no lighting controls; (240) 13w CFL wall sconces; no lighting controls. |
| (3) 70 ton Packaged VAV system 10.3 EER/80% TE, standard efficiency variable speed fan motors; 25% VAV boxes, hot water reheat on perimeter zones with 82% AFUE boiler, fixed temp. economizer |
| R-6 duct insulation w/ ducts in conditioned |
| (1) Boiler (combined with space heat) 82% AFUE |

## 4.0 Incremental Cost to Exceed 2008 Standards by 15%

The following tables list the energy features and/or equipment included in the 2008 Standards base design, the efficient measure options, and an estimate of the incremental cost for each measure included **to improve the building performance to use 15% less TDV energy than the corresponding Title 24 base case design**.

### Small Single Family House

- 2,025 square feet
- 2-story
- 20.2% glazing/floor area ratio

**Incremental Cost Estimate to Exceed Title 24 by 15%**
**Single Family Prototype: 2,025 SF, Option 1 - No AC** **2025 sf** **Climate Zone 2**

| Energy Efficiency Measures | Change Type | Incremental Cost Estimate | | |
|---|---|---|---|---|
| | | Min | Max | Avg |
| R-19 Roof w/ Radiant Barrier (from R-38 w/Radiant Barrier): 1,443 sf @ 0.30 to 0.45/sf | Downgrade | $ (649) | $ (433) | $ (541) |
| R-19 Walls (from R-13): 2,550 sf @$0.31 to $0.54/sf | Upgrade | $ 791 | $ 1,377 | $ 1,084 |
| R-19 Raised Floor over Garage/Open at 2nd Floor | - | $ - | $ - | $ - |
| R-0 Slab on Grade | - | $ - | $ - | $ - |
| Low E2 Vinyl Windows, U=0.36, SHGC=0.30 | - | $ - | $ - | $ - |
| Furnace: 80% AFUE | - | $ - | $ - | $ - |
| Air Conditioner: None | - | $ - | $ - | $ - |
| R-4.2 Attic Ducts (from R-6) | Downgrade | $ (325) | $ (225) | $ (275) |
| Reduced Duct Leakage/Testing (HERS) | Upgrade | $ 300 | $ 600 | $ 450 |
| 50 Gallon Gas Water Heater: EF=0.62 | - | $ - | $ - | $ - |
| **Total Incremental Cost of Energy Efficiency Measures:** | | **$ 116** | **$ 1,319** | **$ 718** |
| **Total Incremental Cost per Square Foot:** | | **$ 0.06** | **$ 0.65** | **$ 0.35** |

**Incremental Cost Estimate to Exceed Title 24 by 15%**
**Single Family Prototype: 2,025 SF, Option 2 - No AC** **2025 sf** **Climate Zone 2**

| Energy Efficiency Measures | Change Type | Incremental Cost Estimate | | |
|---|---|---|---|---|
| | | Min | Max | Avg |
| R-30 Roof w/ Radiant Barrier (from R-38 w/Radiant Barrier): 1,443 sf @ 0.15 to 0.20/sf | Downgrade | $ (289) | $ (216) | $ (253) |
| R-13 Walls | - | $ - | $ - | $ - |
| R-19 Raised Floor over Garage/Open at 2nd Floor | - | $ - | $ - | $ - |
| R-0 Slab on Grade | - | $ - | $ - | $ - |
| Low E2 Vinyl Windows, U=0.36, SHGC=0.30 | - | $ - | $ - | $ - |
| Furnace: 92% AFUE (from 80% AFUE) | Upgrade | $ 500 | $ 1,200 | $ 850 |
| Air Conditioner: None | - | $ - | $ - | $ - |
| R-8 Attic Ducts (from R-6) | Upgrade | $ 225 | $ 325 | $ 275 |
| Reduced Duct Leakage/Testing (HERS) | Upgrade | $ 300 | $ 600 | $ 450 |
| 50 Gallon Gas Water Heater: EF=0.63 (from EF=0.62) | Upgrade | $ - | $ 50 | $ 25 |
| **Total Incremental Cost of Energy Efficiency Measures:** | | **$ 736** | **$ 1,959** | **$ 1,347** |
| **Total Incremental Cost per Square Foot:** | | **$ 0.36** | **$ 0.97** | **$ 0.67** |

**Incremental Cost Estimate to Exceed Title 24 by 15%**
**Single Family Prototype: 2,025 SF, Option 3 with AC** **2025 sf** **Climate Zone 2**

| Energy Efficiency Measures | Change Type | Incremental Cost Estimate | | |
|---|---|---|---|---|
| | | Min | Max | Avg |
| R-19 Roof w/ Radiant Barrier (from R-30 w/Radiant Barrier): 1,443 sf @ 0.25 to 0.35/sf | Downgrade | $ (505) | $ (361) | $ (433) |
| R-19 Walls (from R-13): 2,550 sf @$0.31 to $0.54/sf | Upgrade | $ 791 | $ 1,377 | $ 1,084 |
| R-19 Raised Floor over Garage/Open at 2nd Floor | - | $ - | $ - | $ - |
| R-0 Slab on Grade | - | $ - | $ - | $ - |
| Low E2 Vinyl Windows, U=0.36, SHGC=0.30 | - | $ - | $ - | $ - |
| Furnace: 80% AFUE | - | $ - | $ - | $ - |
| Air Conditioner: 13 SEER, 11 EER (HERS) | - | $ - | $ - | $ - |
| Air Conditioner: Refrig. Charge (HERS) | - | $ - | $ - | $ - |
| R-4.2 Attic Ducts (from R-6) | Downgrade | $ (325) | $ (225) | $ (275) |
| Reduced Duct Leakage/Testing (HERS) | Upgrade | $ 300 | $ 600 | $ 450 |
| 50 Gallon Gas Water Heater: EF=0.60 (from EF=0.62) | Downgrade | $ (200) | $ (100) | $ (150) |
| **Total Incremental Cost of Energy Efficiency Measures:** | | **$ 60** | **$ 1,291** | **$ 676** |
| **Total Incremental Cost per Square Foot:** | | **$ 0.03** | **$ 0.64** | **$ 0.33** |

**Incremental Cost Estimate to Exceed Title 24 by 15%**
**Single Family Prototype: 2,025 SF, Option 4 with AC** **2025 sf** **Climate Zone 2**

| Energy Efficiency Measures | Change Type | Incremental Cost Estimate | | |
|---|---|---|---|---|
| | | Min | Max | Avg |
| R-30 Roof w/ Radiant Barrier | - | $ - | $ - | $ - |
| R-21 Walls (from R-13): 2,550 sf @ $0.45 to $0.70/sf | Upgrade | $ 1,148 | $ 1,785 | $ 1,466 |
| R-19 Raised Floor over Garage/Open at 2nd Floor | - | $ - | $ - | $ - |
| R-0 Slab on Grade | - | $ - | $ - | $ - |
| Low E2 Vinyl Windows, U=0.36, SHGC=0.30 | - | $ - | $ - | $ - |
| Furnace: 80% AFUE | - | $ - | $ - | $ - |
| Air Conditioner: 13 SEER, 11 EER (HERS) | - | $ - | $ - | $ - |
| Air Conditioner: Refrig. Charge (HERS) | - | $ - | $ - | $ - |
| R-6 Attic Ducts | - | $ - | $ - | $ - |
| 50 Gallon Gas Water Heater: EF=0.63 (from EF=0.62) | Upgrade | $ - | $ 50 | $ 25 |
| **Total Incremental Cost of Energy Efficiency Measures:** | | **$ 1,148** | **$ 1,835** | **$ 1,491** |
| **Total Incremental Cost per Square Foot:** | | **$ 0.57** | **$ 0.91** | **$ 0.74** |

## Large Single Family House

- 4,500 square feet
- 2-story
- 22.0% glazing/floor area ratio

**Incremental Cost Estimate to Exceed Title 24 by 15%**
**Single Family Prototype: 4,500 SF, Option 1 - No AC** **4500 sf** **Climate Zone 2**

| Energy Efficiency Measures | Change Type | Incremental Cost Estimate | | |
|---|---|---|---|---|
| | | Min | Max | Avg |
| R-30 Roof w/ Radiant Barrier | - | $ - | $ - | $ - |
| R-21 Walls (from R-13): 2,518 sf @ $0.45 to $0.70/sf | Upgrade | $ 1,133 | $ 1,763 | $ 1,448 |
| R-30 Raised Floor (from R-19): 2,700 sf @ $0.25 to $0.35 | Upgrade | $ 675 | $ 945 | $ 810 |
| Low E2 Vinyl Windows, U=0.36, SHGC=0.30 | - | $ - | $ - | $ - |
| (2) Furnaces: 80% AFUE | - | $ - | $ - | $ - |
| Air Conditioner: None | - | $ - | $ - | $ - |
| R-8 Attic Ducts (from R-6) | Upgrade | $ 450 | $ 650 | $ 550 |
| Reduced Duct Leakage/Testing (HERS) | - | $ - | $ - | $ - |
| (2) 50 Gallon Gas Water Heaters: EF=0.63 (from EF=0.60) | Upgrade | $ 200 | $ 500 | $ 350 |
| Pipe Insulation | Upgrade | $ 300 | $ 400 | $ 350 |
| **Total Incremental Cost of Energy Efficiency Measures:** | | **$ 2,758** | **$ 4,258** | **$ 3,508** |
| **Total Incremental Cost per Square Foot:** | | **$ 0.61** | **$ 0.95** | **$ 0.78** |

**Incremental Cost Estimate to Exceed Title 24 by 15%**
**Single Family Prototype: 4,500 SF, Option 2 - No AC** **4500 sf** **Climate Zone 2**

| Energy Efficiency Measures | Change Type | Incremental Cost Estimate | | |
|---|---|---|---|---|
| | | Min | Max | Avg |
| R-30 Roof w/ Radiant Barrier | - | $ - | $ - | $ - |
| R-19 Walls (from R-13): 2,518 sf @ $0.31 to $0.54/sf | Upgrade | $ 781 | $ 1,360 | $ 1,070 |
| R-19 Raised Floor | - | $ - | $ - | $ - |
| Low E2 Vinyl Windows, U=0.36, SHGC=0.30 | - | $ - | $ - | $ - |
| (2) Furnaces: 92% AFUE (from 80% AFUE) | Upgrade | $ 1,000 | $ 2,400 | $ 1,700 |
| Air Conditioner: None | - | $ - | $ - | $ - |
| R-6 Attic Ducts | - | $ - | $ - | $ - |
| Reduced Duct Leakage/Testing (HERS) | - | $ - | $ - | $ - |
| (2) 50 Gallon Gas Water Heaters: EF=0.63 (from EF=0.60) | Upgrade | $ 200 | $ 500 | $ 350 |
| **Total Incremental Cost of Energy Efficiency Measures:** | | **$ 1,981** | **$ 4,260** | **$ 3,120** |
| **Total Incremental Cost per Square Foot:** | | **$ 0.44** | **$ 0.95** | **$ 0.69** |

**Incremental Cost Estimate to Exceed Title 24 by 15%**
**Single Family Prototype: 4,500 SF, Option 3 with AC** **4500 sf** **Climate Zone 2**

| Energy Efficiency Measures | Change | Incremental Cost Estimate | | |
|---|---|---|---|---|
| R-38 Roof w/ Radiant Barrier | - | $ - | $ - | $ - |
| R-19 Walls (from R-13): 2,518 sf @ $0.31 to $0.54/sf | Upgrade | $ 781 | $ 1,360 | $ 1,070 |
| R-19 Raised Floor | - | $ - | $ - | $ - |
| Low E2 Vinyl Windows, U=0.36, SHGC=0.30 | - | $ - | $ - | $ - |
| (2) Furnaces: 80% AFUE | - | $ - | $ - | $ - |
| (2) Air Conditioners: 13 SEER, 11 EER (HERS) | Upgrade | $ 50 | $ 150 | $ 100 |
| (2) Air Conditioner: Refrig. Charge (HERS) | Upgrade | $ 300 | $ 400 | $ 350 |
| R-4.2 Attic Ducts (from R-6) | Downgrade | $ (650) | $ (450) | $ (550) |
| Reduced Duct Leakage/Testing (HERS) | - | $ - | $ - | $ - |
| (2) Instantaneous Gas Water Heaters: RE=0.80 (from 50 Gal Gas: EF=0.62) | Upgrade | $ 1,800 | $ 3,000 | $ 2,400 |
| **Total Incremental Cost of Energy Efficiency Measures:** | | **$ 2,281** | **$ 4,460** | **$ 3,370** |
| **Total Incremental Cost per Square Foot:** | | **$ 0.51** | **$ 0.99** | **$ 0.75** |

**Incremental Cost Estimate to Exceed Title 24 by 15%**
**Single Family Prototype: 4,500 SF, Option 4 with AC** **4500 sf** **Climate Zone 2**

| Energy Efficiency Measures | Change | Incremental Cost Estimate | | |
|---|---|---|---|---|
| R-38 Roof w/ Radiant Barrier | - | $ - | $ - | $ - |
| R-19 Walls (from R-13): 2,518 sf @ $0.31 to $0.54/sf | Upgrade | $ 781 | $ 1,360 | $ 1,070 |
| R-19 Raised Floor | - | $ - | $ - | $ - |
| Low E2 Vinyl Windows, U=0.36, SHGC=0.30 | - | $ - | $ - | $ - |
| (2) Furnaces: 92% AFUE (from 80% AFUE) | Upgrade | $ 1,000 | $ 2,400 | $ 1,700 |
| (2) Air Conditioners: 13 SEER, 11 EER (HERS) | Upgrade | $ 50 | $ 150 | $ 100 |
| (2) Air Conditioner: Refrig. Charge (HERS) | Upgrade | $ 300 | $ 400 | $ 350 |
| R-4.2 Attic Ducts (from R-6) | Downgrade | $ (650) | $ (450) | $ (550) |
| Reduced Duct Leakage/Testing (HERS) | - | $ - | $ - | $ - |
| (2) 50 Gallon Gas Water Heaters: EF=0.63 (from EF=0.62) | Upgrade | $ - | $ 100 | $ 50 |
| Pipe Insulation | Upgrade | $ 300 | $ 400 | $ 350 |
| **Total Incremental Cost of Energy Efficiency Measures:** | | **$ 1,781** | **$ 4,360** | **$ 3,070** |
| **Total Incremental Cost per Square Foot:** | | **$ 0.40** | **$ 0.97** | **$ 0.68** |

## Low-rise Multi-family Apartments

- 8,442 square feet
- 8 units/2-story
- 12.5% glazing/floor area ratio

**Incremental Cost Estimate to Exceed Title 24 by 15%**
**Multi-Family Prototype: 8,442 SF, Option 1 - No AC** **8442 sf** **Climate Zone 2**

| Energy Efficiency Measures | Change Type | Incremental Cost Estimate | | |
|---|---|---|---|---|
| | | Min | Max | Avg |
| R-30 Roof w/ Radiant Barrier | - | $ - | $ - | $ - |
| R-21 Walls (from R-13 ): 10,146 sf @ $0.45 to $0.70/sf | Upgrade | $ 4,566 | $ 7,102 | $ 5,834 |
| R-0 Slab on Grade | - | $ - | $ - | $ - |
| Low E2 Vinyl, U=0.36, SHGC=0.30 | - | $ - | $ - | $ - |
| (8) Furnaces: 80% AFUE | - | $ - | $ - | $ - |
| Air Conditioner: None | - | $ - | $ - | $ - |
| R-6 Attic Ducts | - | $ - | $ - | $ - |
| (8) 40 Gallon Gas Water Heaters: EF=0.63 | - | $ - | $ - | $ - |
| **Total Incremental Cost of Energy Efficiency Measures:** | | **$ 4,566** | **$ 7,102** | **$ 5,834** |
| **Total Incremental Cost per Square Foot:** | | **$ 0.54** | **$ 0.84** | **$ 0.69** |

**Incremental Cost Estimate to Exceed Title 24 by 15%**
**Multi-Family Prototype: 8,442 SF, Option 2 - No AC** **8442 sf** **Climate Zone 2**

| Energy Efficiency Measures | Change Type | Incremental Cost Estimate | | |
|---|---|---|---|---|
| | | Min | Max | Avg |
| R-19 Roof w/ Radiant Barrier (from R-30 w/Radiant Barrier): 4,221 sf @ 0.25 to 0.35/sf | Upgrade | $ (1,477) | $ (1,055) | $ (1,266) |
| R-19 Walls (from R-13 ): 10,146 sf @ $0.31 to $0.54/sf | Upgrade | $ 3,145 | $ 5,479 | $ 4,312 |
| R-0 Slab on Grade | - | $ - | $ - | $ - |
| Low E2 Vinyl, U=0.36, SHGC=0.30 | - | $ - | $ - | $ - |
| (8) Furnaces: 80% AFUE | - | $ - | $ - | $ - |
| Air Conditioner: None | - | $ - | $ - | $ - |
| R-4.2 Attic Ducts (from R-6) | Downgrade | $ (1,600) | $ (1,000) | $ (1,300) |
| Reduced Duct Leakage/Testing (HERS) | Upgrade | $ 2,400 | $ 4,800 | $ 3,600 |
| (8) 40 Gallon Gas Water Heaters: EF=0.60 (from EF=0.63) | Downgrade | $ (2,000) | $ (800) | $ (1,400) |
| **Total Incremental Cost of Energy Efficiency Measures:** | | **$ 468** | **$ 7,424** | **$ 3,946** |
| **Total Incremental Cost per Square Foot:** | | **$ 0.06** | **$ 0.88** | **$ 0.47** |

**Incremental Cost Estimate to Exceed Title 24 by 15%**
**Multi-Family Prototype: 8,442 SF, Option 3 with AC** **8442 sf** **Climate Zone 2**

| Energy Efficiency Measures | Change Type | Incremental Cost Estimate | | |
|---|---|---|---|---|
| | | Min | Max | Avg |
| R-19 Roof w/ Radiant Barrier (from R-38 w/Radiant Barrier): 4,221 sf @ 0.30 to 0.45/sf | Downgrade | $ (1,899) | $ (1,266) | $ (1,583) |
| R-21 Walls (from R-13 ): 10,146 sf @ $0.45 to $0.70/sf | Upgrade | $ 4,566 | $ 7,102 | $ 5,834 |
| R-0 Slab on Grade | - | $ - | $ - | $ - |
| Low E2 Vinyl, U=0.36, SHGC=0.30 | - | $ - | $ - | $ - |
| (8) Furnaces: 80% AFUE | - | $ - | $ - | $ - |
| (8) Air Conditioners: 13 SEER, 11 EER (HERS) | Upgrade | $ 200 | $ 600 | $ 400 |
| (8) Air Conditioner: Refrig. Charge (HERS) | Upgrade | $ 1,200 | $ 1,600 | $ 1,400 |
| R-8 Attic Ducts | - | $ - | $ - | $ - |
| (8) 40 Gallon Gas Water Heaters: EF=0.63 | - | $ - | $ - | $ - |
| **Total Incremental Cost of Energy Efficiency Measures:** | | **$ 4,066** | **$ 8,036** | **$ 6,051** |
| **Total Incremental Cost per Square Foot:** | | **$ 0.48** | **$ 0.95** | **$ 0.72** |

**Incremental Cost Estimate to Exceed Title 24 by 15%**
**Multi-Family Prototype: 8,442 SF, Option 4 with AC** **8442 sf** **Climate Zone 2**

| Energy Efficiency Measures | Change Type | Incremental Cost Estimate | | |
|---|---|---|---|---|
| | | Min | Max | Avg |
| R-38 Roof w/ Radiant Barrier | - | $ - | $ - | $ - |
| R-19 Walls (from R-13 ): 10,146 sf @ $0.31 to $0.54/sf | Upgrade | $ 3,145 | $ 5,479 | $ 4,312 |
| R-0 Slab on Grade | - | $ - | $ - | $ - |
| Low E2 Vinyl, U=0.36, SHGC=0.30 | - | $ - | $ - | $ - |
| (8) Furnaces: 80% AFUE | - | $ - | $ - | $ - |
| (8) Air Conditioners: 13 SEER, 11 EER (HERS) | Upgrade | $ 200 | $ 600 | $ 400 |
| (8) Air Conditioner: Refrig. Charge (HERS) | Upgrade | $ 1,200 | $ 1,600 | $ 1,400 |
| R-8 Attic Ducts | - | $ - | $ - | $ - |
| (8) 40 Gallon Gas Water Heaters: EF=0.63 | - | $ - | $ - | $ - |
| **Total Incremental Cost of Energy Efficiency Measures:** | | **$ 4,545** | **$ 7,679** | **$ 6,112** |
| **Total Incremental Cost per Square Foot:** | | **$ 0.54** | **$ 0.91** | **$ 0.72** |

**Incremental Cost Estimate to Exceed Title 24 by 15%**
**Multi-Family Prototype: 8,442 SF, Option 5 with AC** **8442 sf** **Climate Zone 2**

| Energy Efficiency Measures | Change Type | Incremental Cost Estimate | | |
|---|---|---|---|---|
| | | Min | Max | Avg |
| R-19 Roof w/ Radiant Barrier (from R-38 w/Radiant Barrier): 4,221 sf @ 0.30 to 0.45/sf | Downgrade | $ (1,899) | $ (1,266) | $ (1,583) |
| R-19 Walls (from R-13 ): 10,146 sf @ $0.31 to $0.54/sf | Upgrade | $ 3,145 | $ 5,479 | $ 4,312 |
| R-0 Slab on Grade | - | $ - | $ - | $ - |
| Low E2 Vinyl, U=0.36, SHGC=0.30 | - | $ - | $ - | $ - |
| (8) Furnaces: 80% AFUE | - | $ - | $ - | $ - |
| (8) Air Conditioners: 13 SEER | - | $ - | $ - | $ - |
| (8) Air Conditioner: Refrig. Charge (HERS) | Upgrade | $ 1,200 | $ 1,600 | $ 1,400 |
| R-4.2 Attic Ducts (from R-8) | Downgrade | $ (3,000) | $ (2,000) | $ (2,500) |
| Reduced Duct Leakage/Testing (HERS) | Upgrade | $ 2,400 | $ 4,800 | $ 3,600 |
| (8) 40 Gallon Gas Water Heaters: EF=0.60 (from EF=0.63) | Downgrade | $ (2,000) | $ (800) | $ (1,400) |
| **Total Incremental Cost of Energy Efficiency Measures:** | | **$ (154)** | **$ 7,813** | **$ 3,829** |
| **Total Incremental Cost per Square Foot:** | | **$ (0.02)** | **$ 0.93** | **$ 0.45** |

## High-rise Multifamily Apartments

- 36,800 sf,
- 40 units/4-story
- Window to Wall Ratio = 31.6%

**Incremental Cost Estimate to Exceed Title 24 by 15%**
**High-rise Residential Prototype: 36,800 SF, Option 1** **Climate Zone 2**

| Energy Efficiency Measures to Exceed Title 24 by 15% | Change Type | Incremental Cost Estimate | | |
|---|---|---|---|---|
| | | Min | Max | Avg |
| R-19 Metal Roof w/ **R-15 (3") rigid insulation;** cool roof Reflectance = 0.55 Emittance = 0.75; 9,200 sf @ $0.75 - $1.00/sf | Upgrade | $ 15,600 | $ 24,960 | $ 20,280 |
| R-19 in Metal Frame Walls | - | - | - | - |
| **R-6** (K-13 spray-on) Raised Slab over parking garage; 9,200 sf @ $0.50 - $0.75/sf | Upgrade | $ 4,600 | $ 6,900 | $ 5,750 |
| Dual Metal Windows: COG U-factor=0.3**, COG SHGC=0.27** 6,240 sf @ $1.50 to $2.50/sf | Upgrade | $ 9,360 | $ 15,600 | $ 12,480 |
| 2 ton 4-pipe fan coil, **98% AFUE boiler**, 70-ton scroll air cooled chiller 0.72 KW/ton | Upgrade | $ 2,500 | $ 4,000 | $ 3,250 |
| Central DHW boiler: **98% AFUE** and recirculating system w/ timer-temperature controls with **premium** variable speed pump | Upgrade | $ 2,500 | $ 4,000 | $ 3,250 |
| **Total Incremental Cost of Energy Efficiency Measures:** | | **$ 34,560** | **$ 55,460** | **$ 45,010** |
| **Total Incremental Cost per Square Foot:** | | **$ 0.94** | **$ 1.51** | **$ 1.22** |

**Incremental Cost Estimate to Exceed Title 24 by 15%**
**High-rise Residential Prototype: 36,800 SF, Option 2** **Climate Zone 2**

| Energy Efficiency Measures to Exceed Title 24 by 15% | Change Type | Incremental Cost Estimate | | |
|---|---|---|---|---|
| | | Min | Max | Avg |
| R-19 Metal Roof w/ R-10 (2") rigid insulation; cool roof **Reflectance = 0.81 Emittance = 0.89;** 9,200 sf @ $0.45 - $0.55/sf | Upgrade | $ 4,140 | $ 5,060 | $ 4,600 |
| R-19 in Metal Frame Walls | - | - | - | - |
| **R-6** (K-13 spray-on) Raised Slab over parking garage; 9,200 sf @ $0.50 - $0.75/sf | Upgrade | $ 4,600 | $ 6,900 | $ 5,750 |
| Dual Metal Windows: COG U-factor=0.3**, COG SHGC=0.27** 6,240 sf @ $1.50 to $2.50/sf | Upgrade | $ 9,360 | $ 15,600 | $ 12,480 |
| 2 ton 4-pipe fan coil, **98% AFUE boiler**, 70-ton scroll air cooled chiller 0.72 KW/ton | Upgrade | $ 2,500 | $ 4,000 | $ 3,250 |
| Central DHW boiler: **98% AFUE** and recirculating system w/ timer-temperature controls with **premium** variable speed pump | Upgrade | $ 2,500 | $ 4,000 | $ 3,250 |
| **Total Incremental Cost of Energy Efficiency Measures:** | | **$ 23,100** | **$ 35,560** | **$ 29,330** |
| **Total Incremental Cost per Square Foot:** | | **$ 0.63** | **$ 0.97** | **$ 0.80** |

**Incremental Cost Estimate to Exceed Title 24 by 15%**
**High-rise Residential Prototype: 36,800 SF, Option 3** **Climate Zone 2**

| Energy Efficiency Measures to Exceed Title 24 by 15% | Change Type | Incremental Cost Estimate | | |
|---|---|---|---|---|
| | | Min | Max | Avg |
| R-19 Metal Roof w/ R-10 (2") rigid insulation; cool roof Reflectance = 0.55 Emittance = 0.75 | - | | | |
| R-19 in Metal Frame Walls | - | | | |
| R-4 (1.25" K-13 spray-on) Raised Slab over parking garage | - | | | |
| Dual Metal Windows: COG U-factor=0.3**, COG SHGC=0.27** 6,240 sf @ $1.50 to $2.50/sf | Upgrade | $ 9,360 | $ 15,600 | $ 12,480 |
| 2 ton 4-pipe fan coil, 84% AFUE boiler, 70-ton scroll air cooled chiller 0.72 KW/ton | - | | | |
| Central DHW boiler: 84% AFUE and recirculating system w/ timer-temperature controls **with 20% solar for hot water and space heating** @ $900 - $1,500 per dwelling unit | Upgrade | $ 36,000 | $ 60,000 | $ 48,000 |
| **Total Incremental Cost of Energy Efficiency Measures:** | | **$ 45,360** | **$ 75,600** | **$ 60,480** |
| **Total Incremental Cost per Square Foot:** | | **$ 1.23** | **$ 2.05** | **$ 1.64** |

## Low-rise Office Building

- Single Story
- 10,580 sf,
- Window to Wall Ratio = 37.1%

**Incremental Cost Estimate to Exceed Title 24 by 15%**
**Nonresidential Prototype: 10,580 SF, Option 1** **Climate Zone 2**

| Energy Efficiency Measures to Exceed Title 24 by 15% | Change Type | Incremental Cost Estimate Min | Max | Avg |
|---|---|---|---|---|
| R-19 under Metal Deck with 3" rigid (R-15) above; **with Cool Roof Reflectance = 0.81, Emittance = 0.89;** 10,580 sf @ $0.45 - $0.55/sf | Upgrade | $ 4,761 | $ 5,819 | $ 5,290 |
| R-19 in Metal Frame Walls | - | $ - | $ - | $ - |
| R-0 (un-insulated) slab-on-grade 1st floor | - | $ - | $ - | $ - |
| Metal windows: COG U=0.30, **COG SHGC=0.38**; 3,200 sf @ $1.00 to $2.00/sf | Upgrade | $ 3,200 | $ 6,400 | $ 4,800 |
| Lighting = 0.783 w/sf: Open Office Areas: (60) 2-lamp T8 fixtures @58w each; no lighting controls; (24) 18w recessed CFLs. Small Offices: (56) 2-lamp T8 fixtures, **(28) multi-level ocupancy sensors @ $75 to $100 each;** (40) 18w recessed CFLs. Support Areas: (32) 18w recessed CFLs; (48) 13w CFL wall sconces; no controls. | Upgrade | $ 2,100 | $ 2,800 | $ 2,450 |
| (3) 10-ton DX units EER=11.1; 82% AFUE furnaces; standard efficiency fan motors; fixed temp. integrated air economizers, **DDC with DCV at spaces, cycle on at night** | Upgrade | $ 2,250 | $ 4,500 | $ 3,375 |
| R-6 duct insulation w/ducts on roof, HERS verified duct leakage | - | $ - | $ - | $ - |
| (1) Tank Gas Water Heaters EF=0.58 | - | $ - | $ - | $ - |
| **Total Incremental Cost of Energy Efficiency Measures:** | | **$ 12,311** | **$ 19,519** | **$ 15,915** |
| **Total Incremental Cost per Square Foot:** | | **$ 1.16** | **$ 1.84** | **$ 1.50** |

**Incremental Cost Estimate to Exceed Title 24 by 15%**
**Nonresidential Prototype: 10,580 SF, Option 2** **Climate Zone 2**

| Energy Efficiency Measures to Exceed Title 24 by 15% | Change Type | Incremental Cost Estimate Min | Max | Avg |
|---|---|---|---|---|
| R-19 under Metal Deck with 3" rigid (R-15) above; **with Cool Roof Reflectance = 0.81, Emittance = 0.89;** 10,580 sf @ $0.45 - $0.55/sf | Upgrade | $ 4,761 | $ 5,819 | $ 5,290 |
| R-19 in Metal Frame Walls | - | $ - | $ - | $ - |
| R-0 (un-insulated) slab-on-grade 1st floor | - | $ - | $ - | $ - |
| Metal windows: COG U=0.30, **COG SHGC=0.27**; 3,200 sf @ $1.50 to $3.00/sf | Upgrade | $ 4,800 | $ 9,600 | $ 7,200 |
| Lighting = 0.678 w/sf: Open Office Areas: **(32) 2-lamp T8 fixtures @74w each;** no lighting controls; (24) 18w recessed CFLs. Small Offices: (56) 2-lamp T8 fixtures, **(28) multi-level ocupancy sensors on T8s @ $75 to $100 each**; (40) 18w recessed CFLs Support Areas: (32) 18w recessed CFLs; (48) 13w CFL wall sconces; no controls. | Upgrade | $ 820 | $ 1,648 | $ 1,234 |
| (3) 10-ton DX units EER=11.1; 82% AFUE furnaces; standard efficiency fan motors; fixed temp. integrated air economizers, **cycle on at night** | Upgrade | $ 450 | $ 750 | $ 600 |
| R-6 duct insulation w/ducts on roof, HERS verified duct leakage | - | $ - | $ - | $ - |
| (1) Tank Gas Water Heaters EF=0.58 | - | $ - | $ - | $ - |
| **Total Incremental Cost of Energy Efficiency Measures:** | | **$ 10,831** | **$ 17,817** | **$ 14,324** |
| **Total Incremental Cost per Square Foot:** | | **$ 1.02** | **$ 1.68** | **$ 1.35** |

**Incremental Cost Estimate to Exceed Title 24 by 15%**
**Nonresidential Prototype: 10,580 SF, Option 3** **Climate Zone 2**

| Energy Efficiency Measures to Exceed Title 24 by 15% | Change Type | Incremental Cost Estimate Min | Max | Avg |
|---|---|---|---|---|
| R-19 under Metal Deck with 3" rigid (R-15) above; **with Cool Roof Reflectance = 0.81, Emittance = 0.89;** 10,580 sf @ $0.45 - $0.55/sf | Upgrade | $ 4,761 | $ 5,819 | $ 5,290 |
| R-19 in Metal Frame Walls | - | $ - | $ - | $ - |
| R-0 (un-insulated) slab-on-grade 1st floor | - | $ - | $ - | $ - |
| Metal windows: COG U=0.30, **COG SHGC=0.31**; 3,200 sf @ $1.5 to $2.50/sf | Upgrade | $ 4,800 | $ 8,000 | $ 6,400 |
| Lighting = 0.678 w/sf: Open Office Areas: **(32) 2-lamp T8 fixtures @74w each;** no lighting controls; (24) 18w recessed CFLs. Small Offices: (56) 2-lamp T8 fixtures, **(28) multi-level ocupancy sensors on T8s @ $75 to $100 each**; (40) 18w recessed CFLs Support Areas: (32) 18w recessed CFLs; (48) 13w CFL wall sconces; no controls | Upgrade | $ 820 | $ 1,648 | $ 1,234 |
| (3) 10-ton DX units EER=11.1; 82% AFUE furnaces; standard efficiency fan motors; fixed temp. integrated air economizers, **cycle on at night** | Upgrade | $ 450 | $ 750 | $ 600 |
| **R-8 duct** insulation w/ducts on roof, HERS verified duct leakage | Upgrade | $ 450 | $ 900 | $ 675 |
| (1) Tank Gas Water Heaters **EF=0.65** | Upgrade | $ 250 | $ 500 | $ 375 |
| **Total Incremental Cost of Energy Efficiency Measures:** | | **$ 11,531** | **$ 17,617** | **$ 14,574** |
| **Total Incremental Cost per Square Foot:** | | **$ 1.09** | **$ 1.67** | **$ 1.38** |

## High-rise Office Building

- 5-story
- 52,900 sf,
- Window to Wall Ratio = 34.5%

**Incremental Cost Estimate to Exceed Title 24 by 15%**
**Nonresidential Prototype: 52,900 SF, Option 1** **Climate Zone 2**

| Energy Efficiency Measures to Exceed Title 24 by 15% | Change Type | Incremental Cost Estimate Min | Max | Avg |
|---|---|---|---|---|
| R-19 under Metal Deck with **3" rigid insulation above (R-15)**, Cool Roof Reflectance = 0.55, Emittance = 0.75; 10580 sf @ $0.75 - $1.00/sf | Upgrade | $ 7,935 | $ 10,580 | $ 9,258 |
| R-19 in Metal Frame Walls | - | $ - | $ - | $ - |
| R-0 (un-insulated) slab-on-grade 1st floor | - | $ - | $ - | $ - |
| Metal windows: **COG U=0.30, COG SHGC=0.38**; 16,000 sf @ $1.50 to $3.00/sf | Upgrade | $ 24,000 | $ 48,000 | $ 36,000 |
| Lighting = 0.858 w/sf: Open Office Areas: (300) 2-lamp T8 fixtures @58w each; no lighting controls; (120) 18w recessed CFLs no lighting controls. Small Offices: (280) 2-lamp T8 58w fixtures on/off lighting controls; (200) 18w recessed CFLs no lighting on/off lighting controls. Support Areas: (160) 18w recessed CFLs no lighting controls; (240) 13w CFL wall sconces; no lighting controls. | - | $ - | $ - | $ - |
| (3) 70 ton Packaged VAV system 10.3 EER/80% TE, standard efficiency variable speed fan motors; 20% VAV boxes, hot water reheat on perimeter zones with 82% AFUE boiler, fixed temp. economizer | - | $ - | $ - | $ - |
| R-6 duct insulation w/ ducts in conditioned | - | $ - | $ - | $ - |
| (1) Boiler (combined with space heat) 82% AFUE | - | $ - | $ - | $ - |
| **Total Incremental Cost of Energy Efficiency Measures:** | | **$ 31,935** | **$ 58,580** | **$ 45,258** |
| **Total Incremental Cost per Square Foot:** | | **$ 0.60** | **$ 1.11** | **$ 0.86** |

**Incremental Cost Estimate to Exceed Title 24 by 15%**

**Nonresidential Prototype: 52,900 SF, Option 1** **Climate Zone 2**

| Energy Efficiency Measures to Exceed Title 24 by 15% | Change Type | Incremental Cost Estimate | | |
|---|---|---|---|---|
| | | Min | Max | Avg |
| R-19 under Metal Deck with **3" rigid insulation above (R-15)**, Cool Roof Reflectance = 0.55, Emittance = 0.75; 10580 sf @ $0.75 - $1.00/sf | Upgrade | $ 7,935 | $ 10,580 | $ 9,258 |
| R-19 in Metal Frame Walls | - | $ - | $ - | $ - |
| R-0 (un-insulated) slab-on-grade 1st floor | - | $ - | $ - | $ - |
| Metal windows: **COG U=0.30, COG SHGC=0.38**; 16,000 sf @ $1.50 to $3.00/sf | Upgrade | $ 24,000 | $ 48,000 | $ 36,000 |
| Lighting = 0.858 w/sf: Open Office Areas: (300) 2-lamp T8 fixtures @58w each; no lighting controls; (120) 18w recessed CFLs no lighting controls. Small Offices: (280) 2-lamp T8 58w fixtures on/off lighting controls; (200) 18w recessed CFLs no lighting on/off lighting controls. Support Areas: (160) 18w recessed CFLs no lighting controls; (240) 13w CFL wall sconces; no lighting controls. | - | $ - | $ - | $ - |
| (3) 70 ton Packaged VAV system 10.3 EER/80% TE, standard efficiency variable speed fan motors; 20% VAV boxes, hot water reheat on perimeter zones with 82% AFUE boiler, fixed temp. economizer | - | $ - | $ - | $ - |
| R-6 duct insulation w/ ducts in conditioned | - | $ - | $ - | $ - |
| (1) Boiler (combined with space heat) 82% AFUE | - | $ - | $ - | $ - |
| **Total Incremental Cost of Energy Efficiency Measures:** | | **$ 31,935** | **$ 58,580** | **$ 45,258** |
| **Total Incremental Cost per Square Foot:** | | **$ 0.60** | **$ 1.11** | **$ 0.86** |

**Incremental Cost Estimate to Exceed Title 24 by 15%**

**Nonresidential Prototype: 52,900 SF, Option 2** **Climate Zone 2**

| Energy Efficiency Measures to Exceed Title 24 by 15% | Change Type | Incremental Cost Estimate | | |
|---|---|---|---|---|
| | | Min | Max | Avg |
| R-19 under Metal Deck with **3" rigid insulation above (R-15)**, Cool Roof Reflectance = 0.55, Emittance = 0.75; 10580 sf @ $0.75 - $1.00/sf | Upgrade | $ 7,935 | $ 10,580 | $ 9,258 |
| R-19 in Metal Frame Walls | - | $ - | $ - | $ - |
| R-0 (un-insulated) slab-on-grade 1st floor | - | $ - | $ - | $ - |
| Metal windows: **COG U=0.30, COG SHGC=0.54**; 16,000 sf @ $1.00 to $2.50/sf | Upgrade | $ 16,000 | $ 40,000 | $ 28,000 |
| Lighting = 0.785 w/sf: Open Office Areas: (300) 2-lamp T8 fixtures @58w each; no lighting controls; (120) 18w recessed CFLs no lighting controls. Small Offices: (280) 2-lamp T8 58w fixtures w/ **140 multi-level ocupancy sensors on T8s @ $75 to $100 each**; (200) 18w recessed CFLs no lighting on/off lighting controls. Support Areas: (160) 18w recessed CFLs no lighting controls; (240) 13w CFL wall sconces; no lighting controls. | Upgrade | $ 10,500 | $ 14,000 | $ 12,250 |
| (3) 70 ton Packaged VAV system 10.3 EER/80% TE, standard efficiency variable speed fan motors; **20% VAV boxes**, hot water reheat on perimeter zones with 82% AFUE boiler, fixed temp. economizer, **cycle on at night** | Upgrade | $ 11,600 | $ 16,225 | $ 13,913 |
| R-6 duct insulation w/ ducts in conditioned | - | $ - | $ - | $ - |
| (1) Boiler (combined with space heat) 82% AFUE | - | $ - | $ - | $ - |
| **Total Incremental Cost of Energy Efficiency Measures:** | | **$ 46,035** | **$ 80,805** | **$ 63,420** |
| **Total Incremental Cost per Square Foot:** | | **$ 0.87** | **$ 1.53** | **$ 1.20** |

## 5.0 Cost -Effectiveness Determination

Regardless of the building design, occupancy profile and number of stories, the incremental improvement in overall annual energy performance of buildings in exceeding the 2008 Standards is determined to be cost-effective. However, each building's overall design, occupancy type and specific design choices may allow for a large range of incremental costs for exceeding 2008 Standards, estimated annual energy cost savings, and subsequent payback period.

### Small Single Family

| Building Description | Total Annual KWh Saving | Total Annual Therms Saving | Incremental First Cost ($) | Annual Energy Cost Savings ($) | Simple Payback (Years) |
|---|---|---|---|---|---|
| 2,025 sf (Option 1) | 321 | 97 | $718 | $169 | 4.2 |
| 2,025 sf (Option 2) | 172 | 125 | $1,348 | $175 | 7.7 |
| 2,025 sf (Option 3) | 334 | 94 | $676 | $168 | 4.0 |
| 2,025 sf (Option 4) | 336 | 95 | $1,492 | $170 | 8.8 |
| Averages: | 291 | 103 | $1,058 | $170 | 6.2 |

***Annual Reduction in CO2-equivalent: 0.66 lb./sq.ft.-year, 1,327 lb./building-year***
***Increased Cost / lb. CO2-e reduction: $0.80***

### Large Single Family

| Building Description | Total Annual KWh Saving | Total Annual Therms Saving | Incremental First Cost ($) | Annual Energy Cost Savings ($) | Simple Payback (Years) |
|---|---|---|---|---|---|
| 4,500 sf (Option 1) | 475 | 142 | $3,508 | $249 | 14.1 |
| 4,500 sf (Option 2) | 321 | 168 | $3,121 | $251 | 12.4 |
| 4,500 sf (Option 3) | 439 | 152 | $3,371 | $254 | 13.3 |
| 4,500 sf (Option 4) | 439 | 137 | $3,071 | $237 | 13.0 |
| Averages: | 419 | 150 | $3,267 | $248 | 13.2 |

***Annual Reduction in CO2-equivalent: 0.43 lb./sq.ft.-year, 1,931 lb./building-year***
***Increased Cost / lb. CO2-e reduction: $1.69***

### Low-rise Multi-family Apartments

| Building Description | Total Annual KWh Saving | Total Annual Therms Saving | Incremental First Cost ($) | Annual Energy Cost Savings ($) | Simple Payback (Years) |
|---|---|---|---|---|---|
| 8-Unit, 8,442 sf (Option 1) | 1410 | 339 | $5,834 | $644 | 9.1 |
| 8-Unit, 8,442 sf (Option 2) | 1476 | 310 | $3,946 | $622 | 6.3 |
| 8-Unit, 8,442 sf (Option 3) | 1493 | 285 | $6,051 | $596 | 10.1 |
| 8-Unit, 8,442 sf (Option 4) | 1526 | 287 | $6,112 | $605 | 10.1 |
| 8-Unit, 8,442 sf (Option 5) | 1575 | 276 | $3,830 | $601 | 6.4 |
| Averages: | 1496 | 299 | $5,155 | $614 | 8.4 |

***Annual Reduction in CO2-equivalent: 0.49 lb./sq.ft.-year, 4,158 lb./building-year***
***Increased Cost / lb. CO2-e reduction: $1.24***

## High-rise Multi-family Apartments

| Building Description | Total Annual KWh Saving | Total Annual Therms Saving | Incremental First Cost ($) | Annual Energy Cost Savings ($) | Simple Payback (Years) |
|---|---|---|---|---|---|
| 36,800 sf (Option 1) | 17462 | 375 | $45,010 | $3,574 | 12.6 |
| 36,800 sf (Option 2) | 18197 | 206 | $29,330 | $3,512 | 8.4 |
| 36,800 sf (Option 3) | 17337 | 738 | $60,480 | $3,966 | 15.3 |
| Averages: | 17665 | 440 | $44,940 | $3,684 | 12.1 |

***Annual Reduction in CO2-equivalent: 0.36 lb./sq.ft.-year, 13,067 lb./building-year***
***Increased Cost / lb. CO2-e reduction: $3.44***

## Low-rise Office Building

| Building Description | Total Annual KWh Saving | Total Annual Therms Saving | Incremental First Cost ($) | Annual Energy Cost Savings ($) | Simple Payback (Years) |
|---|---|---|---|---|---|
| 10,580 sf (Option 1) | 11312 | -152 | $15,915 | $2,875 | 5.5 |
| 10,580 sf (Option 2) | 15304 | -570 | $14,324 | $3,393 | 4.2 |
| 10,580 sf (Option 3) | 13510 | -415 | $14,574 | $3,081 | 4.7 |
| Averages: | 13375 | -379 | $14,938 | $3,116 | 4.8 |

***Annual Reduction in CO2-equivalent: 0.15 lb./sq.ft.-year, 1,607 lb./building-year***
***Increased Cost / lb. CO2-e reduction: $9.29***

## High-rise Office Building

| Building Description | Total Annual KWh Saving | Total Annual Therms Saving | Incremental First Cost ($) | Annual Energy Cost Savings ($) | Simple Payback (Years) |
|---|---|---|---|---|---|
| 52,900 sf (Option 1) | 61230 | 1282 | $45,258 | $19,272 | 2.3 |
| 52,900 sf (Option 2) | 16941 | 1655 | $63,420 | $6,185 | 10.3 |
| 52,900 sf (Option 3) | 33841 | 5280 | $42,196 | $15,602 | 2.7 |
| Averages: | 37337 | 2739 | $50,291 | $13,686 | 5.1 |

***Annual Reduction in CO2-equivalent: 0.92 lb./sq.ft.-year, 36,513 lb./building-year***
***Increased Cost / lb. CO2-e reduction: $1.03***

## Conclusions

Regardless of the building design, occupancy profile and number of stories, the incremental improvement in overall annual energy performance of buildings which exceed the 2008 Title 24 Building Energy Efficiency Standards by 15% appears cost-effective. However, each building's overall design, occupancy type and specific design choices may allow for a large range of incremental first cost and payback. As with simply meeting the requirements of the Title 24 energy standards, a permit applicant complying with the energy requirements of a green building ordinance should carefully analyze building energy performance to reduce incremental first cost and the payback for the required additional energy efficiency measures.